AVIATION WEEK

JUNE 15, 1953

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To the aggressor, whose men
have fallen prey to Panthers*...
TAKE WARNING
...Cougar Jets are coming!
*Grumman Panther Jets, the first Navy jet fighters to see action in Korea, are being succeeded by faster, swept-wing Cougar Jets.
GRUMMAN AIRCRAFT ENGINEERING CORPORATION
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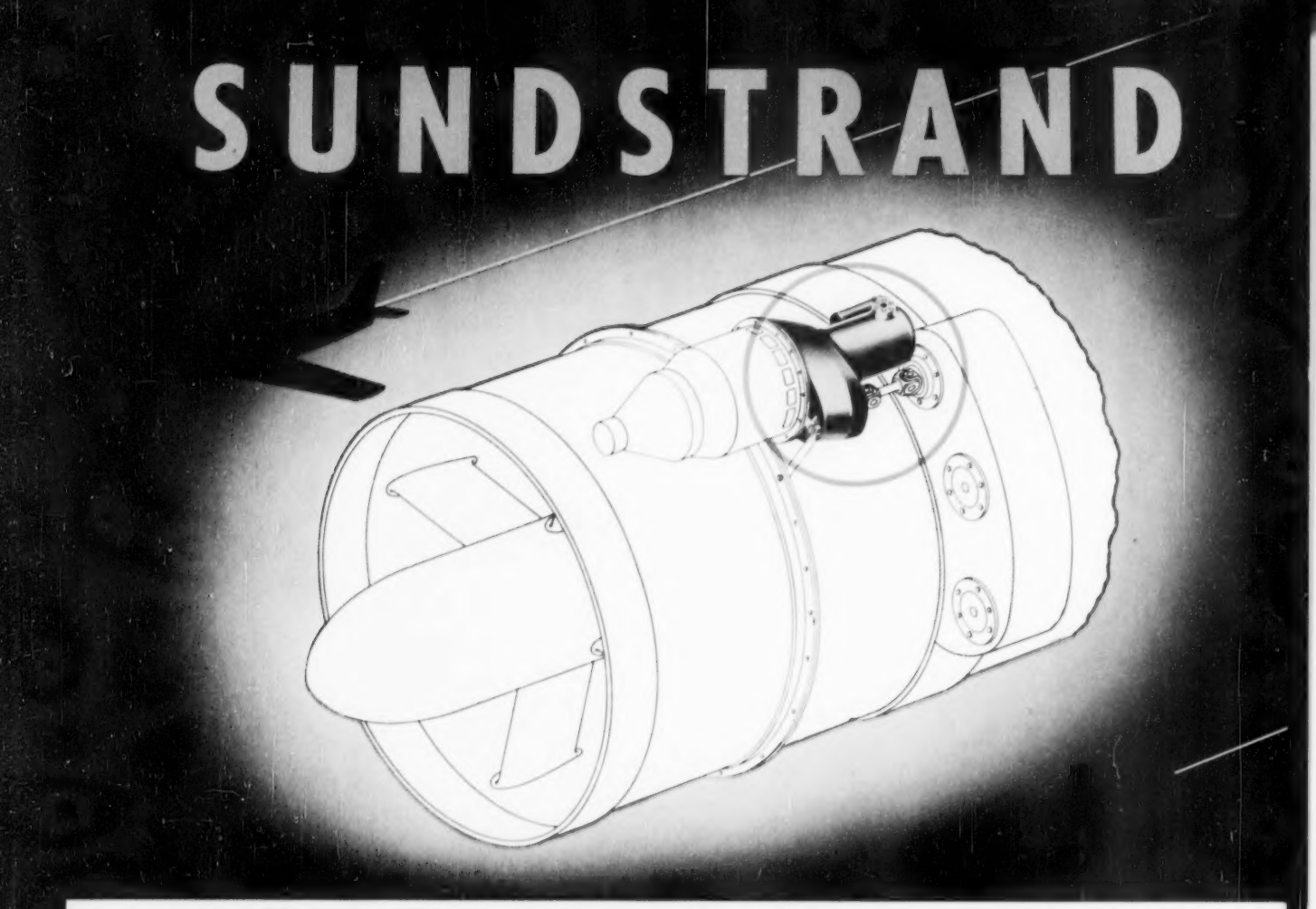

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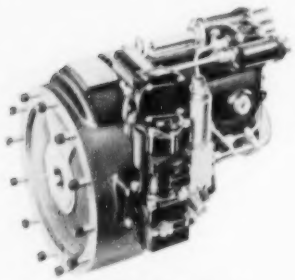

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Volume 58 — June 15, 1953 — Number 24

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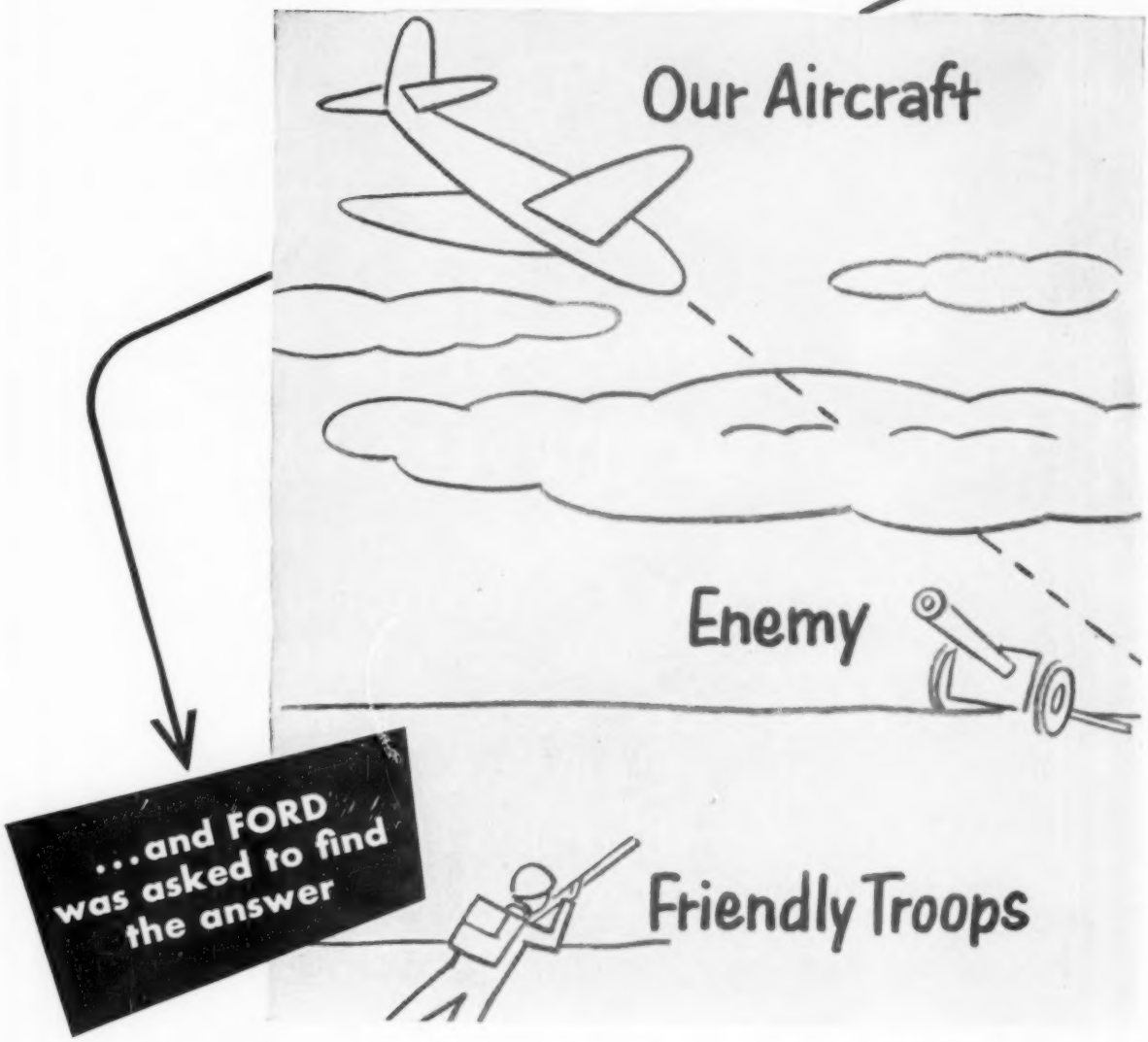
HOW TO OFFER AIR SUPPORT
when target is not seen



Blinding rain! Darkest night! Obscuring clouds! One of these conditions . . . or all three combined . . . deter planes from seeking out and destroying enemy strong points in support of friendly front line troops. That's why the Ford Instrument Company was called in by the Navy to design and build compact, airborne equipment to do this job.

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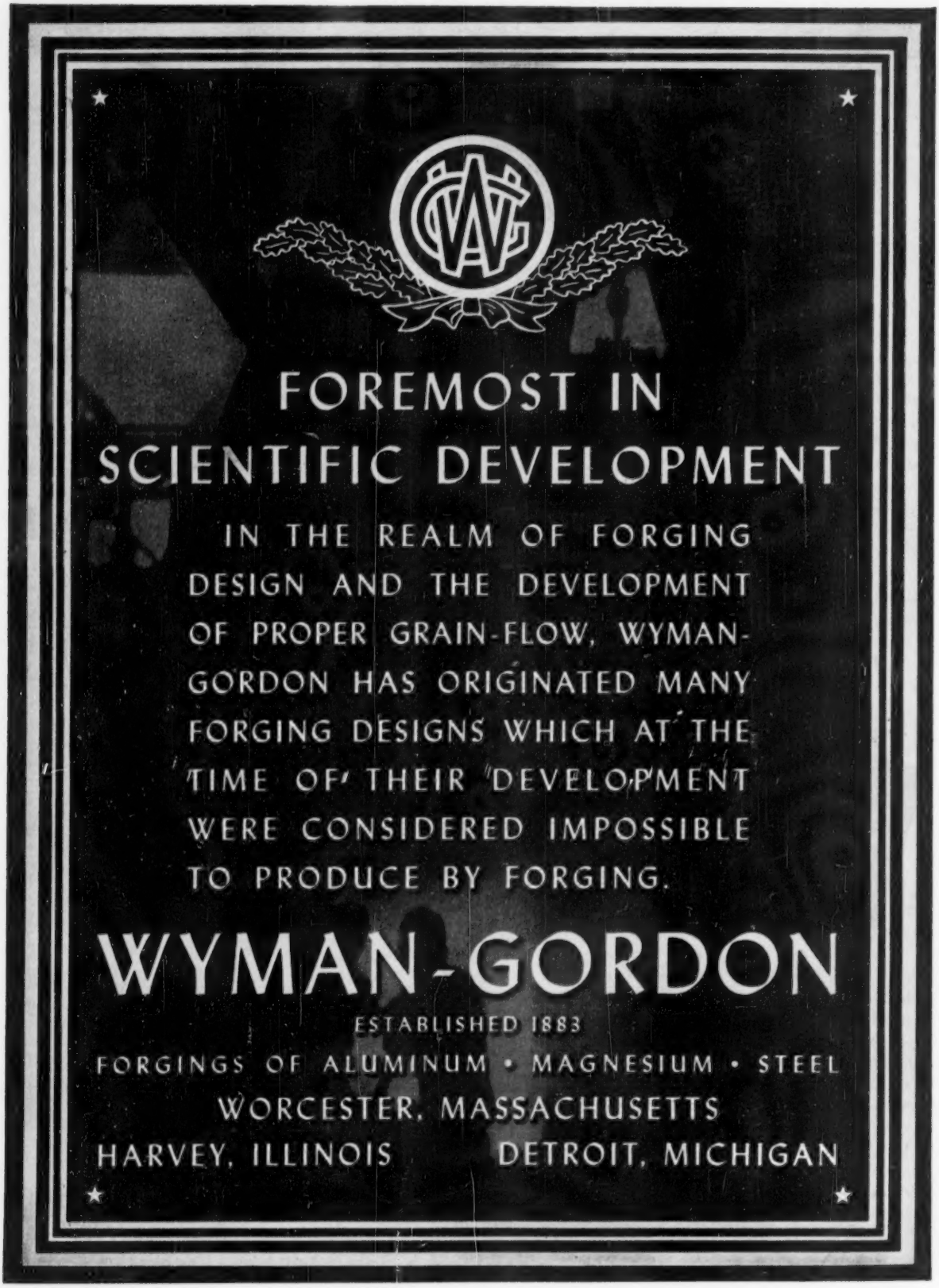
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NEWS DIGEST

Domestic

Cargo-crammed B-47 broke the trans-Atlantic speed record June 5, flying 3,120 mi. from Limestone AFB, Me., to Fairford, England, in 5 hr. 22 min. The record was set on the final flight of a three-day operation transferring 45 Stratojets of the 306th Medium Bombardment Wing from MacDill AFB, Fla., to Britain. Each bomber was heavily loaded with cargo stuffed into bomb bays and Rato pods on each side of the fuselage. A 15-plane squadron left MacDill each day, stopping at Limestone for refueling. The B-47s will fly a 90-day training mission across Europe with 20 KC-97 flying tankers that accompanied the wing to England. The 306th replaces a B-50 wing at Fairford. At conclusion of its mission, the unit is expected to be replaced by the 305th Medium Bombardment Wing.

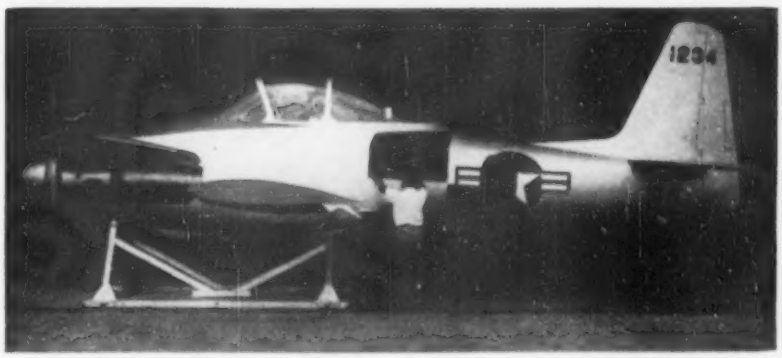
Jet cargo transport capable of 500-mph. speeds is being developed by Fairchild Engine & Airplane Corp., applying research information gained in engineering studies of a highspeed turbine bomber, president Richard S. Boutelle announces. Development of the fast cargo aircraft is described as the primary goal of Fairchild's multi-million-dollar research program. Details and powerplant of the jet transports are not disclosed.

Pan American World Airways' Latin America Division got final subsidy mail pay from CAB, set at 3.5% rather than normal 7% return on investment for Apr. 5, 1948-Dec. 31, 1951. CAB disallowed $5 million of expenses on grounds LAD overscheduled equipment and overspent on sales. Board plans to set a final current and future rate in about two months.

New labor agreement has been signed by Temco Aircraft Corp., Dallas, with the United Automobile Workers (CIO), gearing wages to a new cost-of-living index. The contract wipes out a two-cent wage cut slated under the old index for 6,500 Temco employes.

Brig. Gen. Sory Smith, USAF Director of Public Information, has been nominated for promotion to major general.

First service trials of the Collins integrated flight system were started last week by Swissair on scheduled trans-Atlantic DC-6B flights. Collins says the system will reduce the number of instruments needed on cockpit panels.



FUSELAGE MOCKUP of turboprop trainer designed by Temco Aircraft Corp., Dallas, for USAF competition won by Cessna (Aviation Week Jan. 1, p. 15). Photo of Temco Model 27 shows liberal use of access panels to ease maintenance. Slated to be powered by an Armstrong Siddeley Mamba 6 delivering 1,015 shp. and 27 lb. thrust at 300 mph., the craft is designed to seat two side-by-side. Landing gear is retractable tricycle type. Two other versions have been planned—a four-seat turboprop type and a two-seat Model 29 powered by an Allison 520-C-1 turbojet version.

First foreign purchase of Beech Aircraft Corp.'s two-place, all-metal T-34A Mentor trainer has been made under a more-than-$1-million contract signed by Chile with the Wichita manufacturer.

Raymond B. Kirsner, Commerce Department Deputy Undersecretary for Transportation, died June 6 in New York.

Civil Aeronautics Board will open hearings June 16 on the fatal Meteor Air Transportation crash at Lambert Field, St. Louis, May 23. Six died in crash.

Transocean Air Line's plans to operate a trans-Atlantic air service for Greek shipowner A. S. Onassis (AVIATION WEEK Apr. 20, p. 81) have run into competition. The Greek Minister of Communications reports counter proposals have been received from other Greek financial groups and foreign airlines.

Bendix-Skinner Division, manufacturer of filters for aircraft, automotive and industrial fields, will build a new plant at Detroit for occupancy in November. Plant will consolidate four smaller Detroit facilities.

Sixty-Sixth Tactical Reconnaissance Wing, comprised of former Air National Guard units from Oklahoma, Tennessee and Alabama, is scheduled to leave for duty with NATO forces in Germany. Wing flies RF-80s and RB-26s.

Financial

Lear, Inc., Grand Rapids, Mich., has declared a regular semi-annual dividend of 12½ cents on each share of 5% preferred stock. The corporation reports sales totaling $22 million for the first five months of this year, a gain estimated at 50% higher than the same period of 1952; backlog as of May 31 was $74.4 million, setting an all-time high.

Slick Airways reports a 1952 profit after taxes of $434,328, derived solely from the sale of a C-46 and a prototype DC-6B. Operations incurred a $3,749 loss.

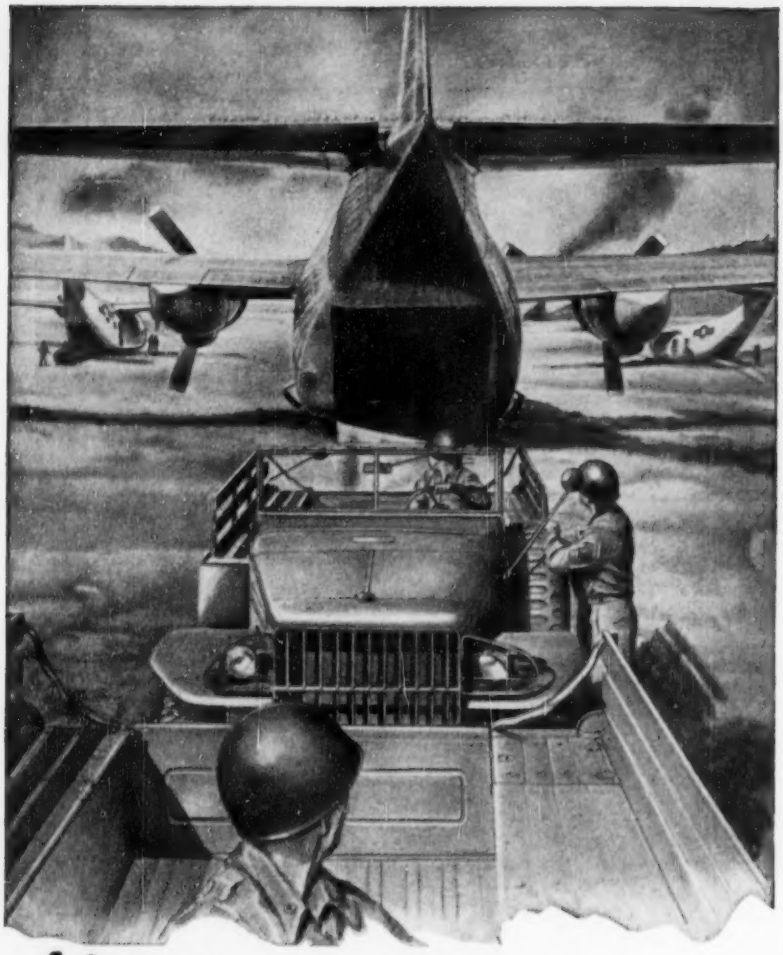
International

Saab J-29, Sweden's 650-mph. swept-wing jet fighter, made its public debut June 6 during an air show over Stockholm.

Maj. Gen. Birger Schyberg, Sweden's air defense chief, was killed June 4 in crash of a training plane north of the nation's capital.

Pocket-size guided missile has been displayed by the French defense department, which says the 30-lb., 200-mph. weapon is designed to smash tanks, can be launched by a foot soldier.

Unofficial speed record was set by a British Canberra jet bomber June 6, flying 2,260 mi. from Wharton, England, to Gander, Newfoundland, at an average of 510 mph.



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Washington Roundup

Slippage Penalties

Neither the aircraft industry nor Pentagon brass has any clear idea yet on how Defense Secretary Charles E. Wilson intends to enforce the penalty for aircraft production slippages with which he threatened manufacturers at his recent Pentagon conference (AVIATION WEEK June 8, p. 13).

Most prevalent industry reaction is that Wilson was just "beating on the table" for the record and actually has no serious intention of dropping aircraft not delivered on time from the production program. If he did, it would result in greatly reduced aircraft deliveries over the next few years and heavy financial losses for most manufacturers with large production programs.

Helicopter Cut

Biggest beating the fast-growing helicopter industry took in the current budget shuffle was in the elimination of five USAF assault helicopter squadrons programmed for Piasecki H-21 and Sikorsky H-19 equipment. The USAF copter squadrons would have been assigned to the Troop Carrier Command. In contrast, Army's helicopter program wasn't touched. Army feels USAF copter squadrons represent duplication of the Army's program for its own transport copter squadrons operating under divisional control.

New CAA Siberia?

Washington observers wonder if the Civil Aeronautics Administration regional office in Kansas City is becoming a new "Siberia" for the exile of high-seniority officials of the controversial Office of Aviation Safety.

Latest to go to Kansas City is Omer Welling, who was acting chief of aircraft engineering in OAS at Washington. Some of Welling's rulings on aircraft safety standards stirred major rows that had to be settled finally by CAA administrator Fred Lee overruling Welling.

Preceding Welling at Kansas City is William B. Davis, formerly deputy director of OAS. Still in Washington is Ernest Hensley, head of OAS.

Super Carrier Issue

Watch for the Navy super carrier issue to pop into the present defense budget row. Democratic senators plan to quiz Defense Secretary Wilson on how funds for the second and third super carriers got into the Navy budget and whether the Joint Chiefs of Staff ever approved these additional carriers.

Pentagon scuttlebutt says JCS approved only the first super carrier and Navy is financing the other two from funds stripped from construction of anti-submarine vessels. Anti-submarine warfare is the Navy's primary mission under present JCS role and mission assignments.

Heavy Press Cuts

After being approved in the Republican Administration's first survey of military construction, the USAF heavy press program is facing heavy going in the current defense economoy drive. No decision has been made public yet, but indications are some parts of the program will be eliminated or postponed—probably the largest, 50,000-ton presses. Despite the high original cost of the heavy press program, it eventually was expected to effect major economies in both time and labor on high-speed aircraft production.

Airmail Boom

Boom in airmail volume and cut in some rates was moving nearer this week as the Post Office legal department reported on how the Postmaster General might cut legal red tape preventing shipment of surface mail by airfreight. This has been a major project of Assistant Postmaster General-Transportation John Allen and executive director of the Transportation Bureau Alfred Graham.

The apparent prohibition against shipping surface mail (3-cent stamps) by air is a Postal Revenue Act clause stating that Post Office shall charge 6 cents per ounce for airmail. Allen and Graham now believe there are more legal reasons why they can ship surface mail by air at less than 6 cents than there are legal obstacles. When they start shipping some regular mail at 20-25 cents a ton-mile, cuts in straight longhaul airmail compensation (now 45-53 cents a ton-mile) may not be far behind.

McNeil's Role

Assistant Defense Secretary Wilfred McNeil, already given much credit for being the guiding hand in the drafting of the new Administration's defense budget which slashed $5 billion from Air Force funds, is now being given much credit for guiding its course on Capitol Hill. The reason: Stanley Sommer, formerly a right-hand man to McNeil is now right-hand man to Sen. Homer Ferguson, chairman of the Senate Military Appropriations Subcommittee. Sommer writes the questions, hands them to Ferguson; Ferguson asks them.

Plane Buying Nosedives

Air Fore procurement of aircraft and related materiel has taken a nosedive since the new Administration took over. During the first six months of fiscal 1953—July-through-December—USAF obligations, reflecting contracts let, averaged $1.2 billion a month. But for the January-through-April period, the average was down to $363 million a month.

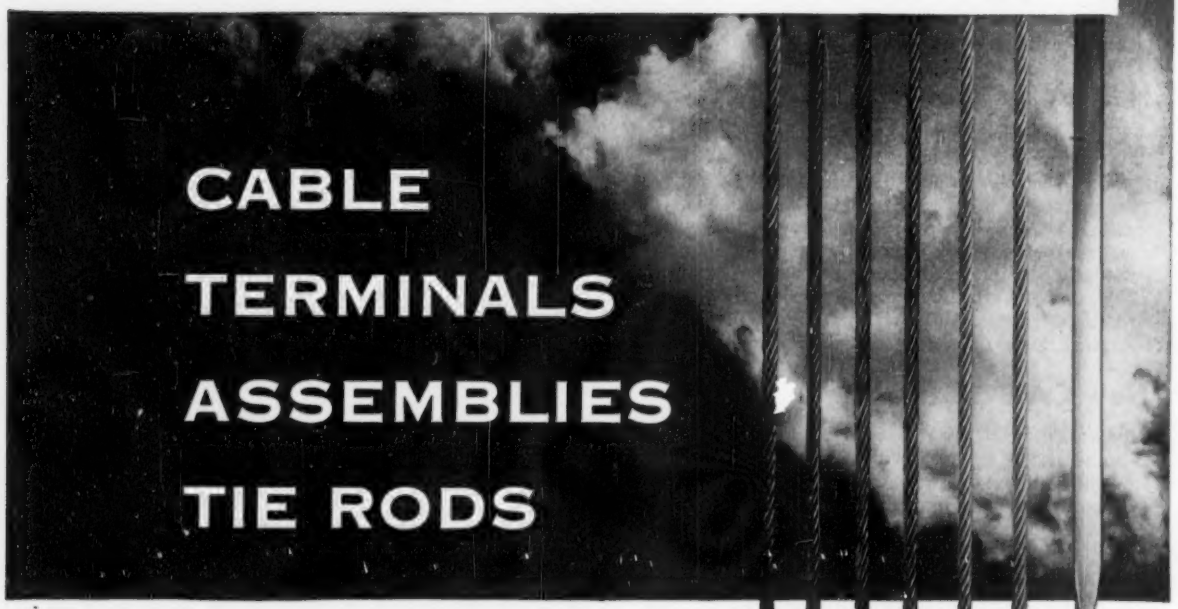
Navy obligating, which got off to a slow start last July, has gone up sharply. Over the July-December period, Navy obligations for aircraft and related procurement averaged only $282 million a month. But for the January-April period this went up to a $735-million-a-month average.

What About GFP?

One of the big problems about slippages in military aircraft schedules has always been keeping military schedules for Government-Furnished Procurement in consonance with the schedules of the aircraft themselves. If Defense Secretary Charles E. Wilson's reported crackdown on behind-schedule aircraft deliveries is effective, he will need to get the GFP schedules on the ball, too. Otherwise the airframe builder will end up with airplanes as complete as he can make them, but still lacking some essential item.

—Washington staff

MACWHYTE



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MACWHYTE

WHO'S WHERE

In the Front Office

Thomas Wolfe has been elected board chairman of Pacific Airmotive Corp., Burbank, Calif., succeeding **Arthur C. Stewart**, who resigned. **H. H. Greenwald** is PAC's new treasurer and assistant to the treasurer.

K. W. Johnson, former chief engineer of the mechanical section, components and systems laboratory, Wright Air Development Center, Dayton, is president and chief engineer of the newly formed K. W. Johnson & Co., also at Dayton, which will specialize in shock and vibration systems.

Maj. Gen. Edmond H. Leavey (USA Ret.) has been named president of Federal Telecommunication Laboratories, Inc., Nutley, N. J.

I. H. Nye, treasurer of General Controls Co., Glendale, Calif., has been elected to the board of directors.

Changes

John W. Young has been named quality control director at North American Aviation, Los Angeles, succeeding the late **R. E. Dawe**. **Fred L. Boeke** has been appointed chief powerplant engineer.

Rolfe Wyer is new assistant plant comptroller for Solar Aircraft Co., San Diego. Also promoted: **Fred S. Hage, Jr.**, chief contract administrator, Des Moines plant; **Herbe Lubke**, assistant purchasing agent; **Wayne Summey**, material control supervisor, and **Homer Bible**, assistant supervisor of material control.

Joel G. Childs has been appointed manager of employe education at Jack & Heintz, Inc., Cleveland. Also promoted: **Frank A. Haag**, sales manager-commercial products, and **Lawrence L. Bechler**, manager of commercial motor sales.

R. Steve Sasnett has been named chief of Boeing Airplane Co.'s technical liaison office, Wichita Division.

C. R. Youmans has been promoted to chief tool planner at **Goodyear Aircraft** Corp., Akron, and **R. H. Lippert** has been named to handle all lighter-than-air craft tool planning.

G. S. Hislop has been named chief designer of the Helicopter Division, **Fairey Aviation Co., London.**

Samuel G. Harris has been named district engineer of Hagan Corp.'s Aeronautical and Special Products Div., Tullahoma, Tenn.

Honors and Elections

Don R. Berlin, president of Piasecki Helicopter Corp., Morton, Pa., has been awarded an honorary Doctor of Engineering by Purdue University, where he was graduated in 1921 as a mechanical engineer. **Frank N. Piasecki**, board chairman, has received an honorary Doctor of Science degree from Pennsylvania Military College, Chester.

W. D. Dilworth, United Air Lines traffic manager, was named chairman of the Universal Air Travel Plan by a recent Paris conference of domestic and international carriers.

INDUSTRY OBSERVER

► Pan American World Airways still is negotiating for a loan of the de Havilland Comet 2 prototype from British Overseas Airways Corp. as soon as BOAC gets its first production models, originally due at the end of this year. However, the Comet 2 program may be set back, partly as a result of the Calcutta Comet 1 crash. The Comet 2 prototype has just completed one set of tropical trials but may have to undergo another before certification.

► **Allison Division, General Motors Corp., is not eager to go ahead with the Model 520-C-1 turbojet, 1,870-lb.-thrust conversion of the T38 turboprop engine, unless it has some definite assurance of sizable orders for the powerplant—presumably for military trainer use. The converted T38 was one of the engines figuring in the TX trainer competition, and some industry critics of the French-designed Marbore engine, with which Cessna won the competition, still are pushing the Allison powerplant on grounds it is more powerful and would be ready for use before the Marbore. Continental Motors Corp. will build the Marbore in this country.**

► Cornell Aeronautical Laboratory, Buffalo, N. Y., is conducting a research study on a new all-altitude landing gear for small airplanes, seeking to achieve the advantages of both the tricycle and the older tailwheel landing gears, and eliminating major disadvantages of both.

► **An Air Force mockup of a proposed system for location and actuation of helicopter cockpit controls is being studied by USAF and Navy experts, with industry participation. The study seeks a greater standardization of controls than has been available heretofore, with greater ease of transition by pilots from one copter to another.**

► Bendix-Pacific Division is exploring the use of a new four-pound telemetering transmitter to aid Navy jets in safe landings on carriers. The airborne device would transmit to a visual indicator on the carrier, for use by the landing signal officer's assistants, who would relay to him the following critical information on final approach: airspeed, engine rpm, and rate of change of speed and rpm. Indications are that U.S. Navy is cool to the idea, so Bendix is discussing it with Canada for use on a new Canadian carrier.

► **British sources say Col. Robert McCormick is in the market for a turboprop Vickers Viscount as an executive plane. In a British visit recently, the Chicago Tribune publisher looked at the smaller prototype Model 630 owned by the British Ministry of Supply and thought it might do. But this particular airplane isn't on the market, so he would have to settle for a production Viscount.**

► Leading edge camber of the wing of the de Havilland Comet 3 has been altered from earlier Comets. The leading edge dips down, to get somewhat the same effect as with a droop-snoot leading edge. De Havilland expects the new airfoil will improve the jet transport's takeoff performance without sacrifice in cruising speed.

► **General Electric is outfitting a Navy Douglas Skyknight F3D with a new experimental interceptor fire control system at GE's Schenectady flight test center. The new system provides "closed loop" operation with the radar-computer signals being fed directly to the autopilot in order to maneuver the plane into the correct intercept position automatically.**

► USAF's Directorate of Flight Safety Research has made a series of design recommendations to the U.S. industry for landing gear, based on a study of Air Force accidents involving gear malfunctions. Recommendations include: forward retraction of gear, so that airflow will help force gear down to locked position in the event of malfunction; simple locks with non-critical adjustments; fast and simple emergency system; visual indication of locked position; moderate tire pressures.

AVIATION WEEK VOL. 58, NO. 24 JUNE 15, 1953

AF Cutback Heads for Fight in Congress

- **Vandenberg challenges 143-wing stretchout.**
- **Wilson asks breathing spell to re-evaluate needs.**

By Katherine Johnsen

Outgoing Air Force Chief of Staff Gen. Hoyt Vandenberg's emphatic challenge of the new Administration's plan to shave down and stretch out the "one shot" 143-wing USAF program threw the issue into the public arena.

It probably will be debated hotly up to the November 1954 elections, with the first showdowns coming in this session of Congress on votes on the revised Administration defense budget which slashed $5 billion off USAF funds for the coming fiscal year.

"You don't mean that the whole 143-wing Air Force would be thrown in immediately at the outbreak of a war?" Sen. Homer Ferguson, chairman of the Military Appropriations Subcommittee, inquired skeptically.

"The 143-wing program has no provision for a reserve force," Vandenberg replied. "I mean we would have to use it all at once. It is a one-shot Air Force."

▶**120 Wings**—The Truman budget, aimed at achievement of 137 wings by mid-1955 and 143 wings by mid-1956, provided $11.7 billion for USAF, earmarking $6.6 billion for aircraft and related procurement and $537 million for research and development. The new Administration's budget shoots at 120-wing strength by mid-1955 and would hold it at this level to mid-1956. It cuts aircraft procurement funds by $3.1 billion and research and development funds by $62 million.

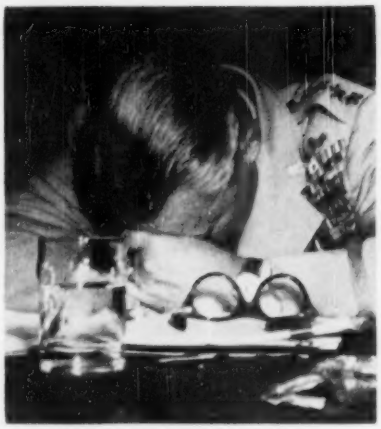
The 23-wing reduction in the new program, Vandenberg said, would involve five fewer strategic air wings, 15 fewer tactical wings, and three less airlift wings. Air defense is vitally affected, he said, because tactical wings based in this country are used as defense interceptors.

Commenting that "I sense from some statements of the military leaders the desire to build up such forces as would defend the whole world," Secretary of Defense Charles Wilson appeared before the committee to meet Vandenberg's challenge.

▶**Less Resistance**—Pointing out that the new Administration wants a complete review of the entire military program, Wilson emphasized that the President and the National Security Council have "neither re-affirmed nor set aside" the 143-wing air program.

He anticipated that the review would be completed in November. If the decision is made to go forward with the 143-wing program, he said, the review "will entail no delay." Wilson insisted that his budget provides all the money that USAF could judiciously spend in fiscal 1954 and is based on a policy of "security first and economy second." He mentioned that "a little less passive resistance" by Air Force "would help."

▶**Air Force View**—The heart of the Wilson-Vandenberg controversy appeared to be whether there should be a "breathing spell" to re-evaluate the 143-wing program, particularly in view of atomic developments. Opposing the review, Vandenberg was emphatic on these points:



VANDENBERG: One-shot Air Force.

WILSON: Security before economy.

• **No new factors** have entered the situation to alter the October 1951 decision of the Joint Chiefs of Staff to build up to a 143-wing air strength as quickly as possible, which was based on "the best available intelligence" that by mid-1954 the Soviet Union would be able to launch an all-out atomic attack against the U. S.

Vandenberg stated: "The size and composition of the proposed force was based on an examination of all factors such as the buildup of our own atomic stockpile, the improvements to be expected in our own weapons and in the enemy's weapons, and the expected size, nature and disposition of Communist military forces. There have been no significant or unexpected changes in weapons development or in forces since the decision was made."

• **Increased atomic firepower** does not warrant any reduction in the number of planes in the 143-wing force. He insisted that it would take the same plane formation to deliver an atomic attack as an attack with conventional firepower.

Under persistent questioning by Sen. Edward Thye, Vandenberg conceded that "over the target" it would take only two planes with atomic bombs to knock out Kelly Field and Randolph Field in Texas, but it would take 30 planes with conventional firepower. But he protested that this was unrealistic.

Thye pointed out that only two planes—a bomber and a weather plane—were required for the Nagasaki and Hiroshima missions. They also observed that because of its greater effectiveness an atomic attack would not have to be

Aircraft Schedules

The aircraft industry has been operating under Military Production Schedule A-19, approved in October 1952. A new schedule recently has been approved by the Defense Department and will become effective July 1, 1953. This schedule calls for delivery of the same number of aircraft scheduled for fiscal 1954 under A-19, plus 75 additional combat aircraft expected to be picked up from slippage in fiscal 1953 deliveries.

followed up by "wave after wave" of plane formations to accomplish a mission as in World War II.

► **Personnel Cut**—Aside from strenuous opposition to the abandonment of the 143-wing goal—or at least indicated abandonment—Vandenberg directed his attack on the Wilson regime primarily at personnel and base construction policies.

Although USAF is expanding, he pointed out, it has been directed to reduce personnel over the coming year from a current strength of 980,000 to 970,000. This will mean that pilot training will have to be held at 7,200 a year, instead of rising to 12,000 a year, he said.

Base construction, already a "serious bottleneck" in the 143-wing program, was held up by Wilson's requirement of a review of all projects, he protested, and more than $500 million appropriated for construction has not yet been released.

Vandenberg mentioned that "there has even been a heavy reduction in funds that can be used for research and for development of planes and weapons of the future."

He did not directly challenge the $3.1-billion cutback in procurement money. He did point out that "to have a jet bomber in 1956 we have to make a contract for it in 1953 or 1954," and defended USAF's $28.5-billion carryover of unexpended procurement funds—a chief target of Wilson—by stating that $25.2 billion represents actual contracts and the remaining $3.3 billion represents funds for procurement already planned and programmed.

► **Talbott View**—USAF Secretary Harold Talbott defended the Wilson budget, but under questioning said that "some additional money could be spent" to push the air program in fiscal 1954, but that "no additional obligational authority for planes would be required."

► **Wilson Comment**—These are points made by Wilson in rebutting Vandenberg:

• **Under the Administration program,** excess planes will be diverted to build up National Guard and Reserve forces. "The condition and effectiveness of these forces must be considered in any honest appraisal of the air power question," Wilson observed; "and we will have approximately 143 wings of Air Force combat strength under the new program by June 1955—120 in the regular Air Force and 22-plus in the National Guard and Reserve." (Vandenberg emphasized that the National Guard and Reserve are "second increments" and could not be counted on for prompt retaliatory action.)

• **The review of USAF's base program** will cause "two- to three-months' delay" on some projects, but overall it will speed up the program, Wilson maintained. "Once we get a good program buttoned up we can move rapidly forward" and won't be continually encountering delays and revisions.

• **Further personnel reductions,** in addition to the 10,000 already directed, may be possible, Wilson anticipated. (Under the Truman budget USAF's personnel strength would go up to 1,061,000 by the end of the fiscal year, compared with the 970,000 level set by Wilson.)

He said the USAF's own estimates of its personnel requirements for the 143-wing program have fluctuated by as much as 44%. He did not intend to permit a lowering of the pilot training goal from 12,000 to 7,200 a year, he said, commenting that the suggestion seemed like "the old military trick of taking something out the civilians can't stand."

• **No decision** was made to make the major $5-billion slash in USAF funds—compared with a $1-billion cut for the Navy and a slight increase for the Army to include Korean expenses, Wilson said. But in going over the military programs item-by-item "it was just found that the Air Force budget was soft in many places." He said the Air Force has continually overestimated its requirements for appropriations and its obligations and expenditures.

An example he used: Last September, USAF estimated fiscal 1953 expenditures for aircraft and related procurement at $7.8 billion and fiscal 1954 expenditures at $9.9 billion. But in the January budget, the estimate was down to $6 billion for 1953 and $7 billion for 1954—a total slippage of $4.7 billion for the two years.

• **Reporting that** he planned a review of USAF's research and development program, Wilson said it was not his intention "to cut down on worthwhile projects." But, he added, "pure" research is not a proper activity of the Defense Department and complained against the policy of "giving every technical school in the country" a contract.

► **Await Rebuttal**—The outcome in Congress on USAF's coming-year budget hinges heavily on Vandenberg's detailed justification for restoration of part—probably about $3.5 billion—of the $5.1-billion slash made by Wilson, which members of the Senate Appropriations Committee have requested. The committee expects to call Wilson back to refute Vandenberg's item-by-item presentation.

Special interest centers on the research and development program, and Wilson has been asked to appear in closed session to report on the "hun-

Talbott Confirms Plane Cutbacks

USAF Secretary Harold E. Talbott last week confirmed on Capitol Hill production cuts in three aircraft programs previously reported by AVIATION WEEK. They are:

• **Beech T-36A twin-engine trainer** (AVIATION WEEK Mar. 30, p. 12 and June 8, p. 13). Talbott said this program had been eliminated "because requirements for which it was designed can be handled by other aircraft." Canadair, Ltd., of Montreal was scheduled for second-source production of the T-36A.

• **Chase C-123B assault transport** (AVIATION WEEK Mar. 30, p. 12 and June 8, p. 13). Talbott said this program had been reduced because of "production delays and other considerations."

• **Boeing B-47 Stratojet bombers** (AVIATION WEEK April 13, p. 13 and June 8, p. 13). AVIATION WEEK's first story that a cut in the B-47 was being considered by Defense Secretary Wilson was denied officially. Talbott admitted last week before the Senate Appropriations Committee that 200 B-47s would be cut, ostensibly on the ground that they were "trainers" to be used by Strategic Air Command in training atomic bomber combat crews. The B-47 cut will come from production scheduled for Lockheed-Marietta and Douglas-Tulsa plants.

Aircraft Spending

Defense Secretary Wilson testified that original USAF estimates for spending on aircraft procurement totaled $7,827,529,000 for fiscal 1953 and $9,907,200,000 for fiscal 1954.

Actually, USAF was able to spend only $6.05 billion in fiscal 1953 for aircraft and it is estimated that between $6.25 billion and $6.7 billion actually will be spent in fiscal 1954.

Wilson testified that production slippages of 22% in combat aircraft and 12% for all types of aircraft accounted for the $5-billion difference between what USAF had appropriated for aircraft procurement and what it actually will be able to spend before the end of fiscal 1954.

dreds" of projects involved in his $62-million cut in this area.

▶ **Background**—Behind the Wilson-Vandenberg controversy are these factors:

• Supporters of the 143-wing program in Congress have a strong buttress for their case in the position of the Joint Chiefs of Staff, as a body—not only Vandenberg.

• Supporters of Wilson program are relying heavily on the backing of the President. It will be at least several months—and long after votes are taken in Congress—before the incoming JCS can complete an evaluation of the whole military situation. Until then, the March JCS statement stands as the top military judgment. Because of his military background and access to intelligence, the President is considered the only one well qualified to question it.

• **President Eisenhower's precise position** is still in some doubt. At a press conference, the President gave general endorsement of the defense budget but declined specifically to take responsibility for the decision to cut USAF $5 billion.

• **Waste and inefficiency in the Air Force** will be spotlighted by Republicans in Congress and used to support Wilson's contention that greater air strength can be achieved with less dollars. An Armed Services Investigating Committee headed by Sen. Styles Bridges is digging into USAF contractors' costs and performance. Last week another Senate Armed Services Subcommittee was set up to investigate USAF fiscal management. The members: Sen. Ralph Flanders, chairman; Sen. Francis Case; Sen. Harry Byrd.

• Sen. Homer Ferguson's course is being watched with interest. As chairman of the Military Appropriations Subcommittee he is the key Senate member on the $5-billion USAF cut. He is up for re-election next year in Michigan, the home state of General Motors Corp., which Wilson formerly headed, and of the late Sen. Arthur Vandenberg, uncle of the present USAF chief.

• Sen. Stuart Symington, former Secretary of the Air Force, is being held in restraint by the Republican leadership. Ferguson refused Symington the privilege of questioning Vandenberg, Wilson and other witnesses before the Military Appropriations Subcommittee, although it is a common courtesy accorded senators who are not members of a committee but who have a special interest in the subject under consideration. Symington requested chairman Leverett Saltonstall to summon Wilson and Vandenberg so that as a member of that committee he might question them.

Additional points by Vandenberg:

• The best test of the efficiency of a service is whether it can meet its mission. "The U. S. Air Force is the only organization in the world that can meet the mission on the Yalu and has been given credit with being the military force responsible for preventing a third world war."

As for management efficiency, he said, the Air Force has continually brought in top business experts to improve its methods and will continue to do so. But the constant change in programs—there have been 10 to 12 different programs during his service as Chief of Staff—do not make for efficiency, he said.

Wilson Orders R&D Fund Slash

A secret attempt by Defense Secretary Wilson to slash aeronautical research funds heavily came to light on Capitol Hill last week in testimony before the Senate Appropriations Committee.

USAF Secretary Harold Talbott revealed that in addition to the $62-million cut in Air Force research funds made in the revised Republican budget, a recent directive from Wilson ordered the Air Force to program for only 75% of the $475 million authorized in the new budget.

A similar slash in Navy's aviation research funds, 25% below the Republican budget level, also has been ordered by Wilson and restrictions have been imposed on spending Navy funds already appropriated for research in previous years.

▶ **Tailored Program**—Talbott testified that USAF was now drawing up a research and development program tailored to fit the additional 25% cut. He said, however, that he expected Wilson to release the full $475 million sought in the 1954 budget after study of the new USAF program.

Congressional sources were irritated at the idea that Wilson was forcing USAF to ask for more funds than they knew he would allow them to spend on research. Pentagon sources expressed doubt USAF would ever get to use more than the 75% of the $475 million now being requested.

They cited verbal instructions accompanying Wilson's hitherto secret directive paring the R&D program to $360 million. These instructions ordered USAF to program downward to reach a level of $300 million for the fiscal 1955 budget and plan on operating its research and development program at that level indefinitely.

▶ **NACA Swamped**—The full scale of the Wilson cuts now planned in aeronautical research and development funds would deal a crippling blow to the future quality of U. S. military aircraft, in the opinion of both military and industry observers.

They point out that the advent of tactical aircraft into the supersonic speed range has imposed a heavier research and development load on the military services and the aircraft industry than at any time in their history. The National Advisory Committee for Aeronautics recently reported that the current demand for aircraft research data in the transonic speed range had swamped the available research facilities in this country.

TALBOTT: The boss says "cut."

Wilson testified that he planned no further cuts in aeronautical research and development funds beyond what he had already made in the fiscal 1954 budget, but Pentagon sources found it difficult to reconcile this statement with the directives that have been issuing from Wilson's Pentagon office scheduling additional 25% cuts.

Industry sources say many specific aircraft and engine development projects aimed at the supersonic speed range would be seriously retarded by the proposed Wilson cuts.

▶ **"Bum Airplane"**—Wilson has told both the aircraft industry leaders and the press that he believes there is a good deal of "boondoggling" in aeronautical research. He told the Senate committee that he believes there is no place for pure research in the Defense Department.

He also said the project for atomic-powered aircraft was being pushed "too fast" and told senators that even if the scientists' hopes had been realized they would have produced a "bum airplane."

Wilson was scheduled to testify in executive session with the Senate Appropriations Committee to detail what projects would be effected by his initially proposed cuts. It was expected that senators would also quiz him on the reasons for ordering an additional 25% cut below his own budget request.

K-F Under Fire

- **Kaiser-Frazer output of C-119 disappoints AF.**
- **Costs included other production, Bridges says.**

Air Force is "frankly disappointed with Kaiser-Frazer's performance," Lt. Gen. Orval R. Cook, USAF Deputy Chief of Staff for Materiel, testified before the Senate Armed Services Subcommittee which investigated K-F's present contract to produce C-119 Flying Boxcars.

Gen. Cook said K-F had been "thoroughly investigated" at the time the contract was let in December 1950. Its Willow Run, Mich., Plant, in which Ford Motor Co. produced B-24s during World War II, was selected for C-119 production because "it is one of the finest aircraft plants in the U.S. and at the time a second manufacturer was needed, K-F had the best available facilities."

▶**Fears "Justified"**—The Senate subcommittee, headed by Sen. Styles Bridges, dug into charges that K-F's C-119 production was excessively costly. Senators also were attempting to determine whether the company, primarily an automobile producer, had tried to charge off non-government production costs to the U. S.

At the conclusion of the hearing, Senator Bridges said the committee's fears "have been justified."

Air Force auditors testified that present K-F production of the C-119 is costing the government $1,339,140 per plane, compared with a unit cost of $265,067 at Fairchild Airplane & Engine Corp., designer of the airplane.

Sen. Harry F. Byrd said costs of K-F C-119 production conceivably could be two or three times higher than Fairchild, but "certainly not four or five times greater."

Cook explained that USAF originally contracted with K-F on a cost-plus-fixed-fee basis to produce 176 C-119s for $82,225,896, or approximately $467,000 per plane. As the contract was amended to meet "more realistic schedules," the general said, costs crept higher.

By May 1952 the cost of one K-F C-119 was $902,000.

▶**Mistake Rectified**—Sidney C. Solomon, USAF resident auditor at the Willow Run plant, told the committee he had uncovered evidence that K-F had "improperly allocated" 35% of its non-government production costs to C-119 production during the first three months of 1951. The mistake was rectified later, he said.

GEN. COOK: Disappointed with K-F.

Solomon claimed also he had found evidence of K-F employes being transferred from automobile departments to C-119 production in time to take advantage of a summer vacation chargeable to the government as defense production costs.

▶**Price Goes Up**—In digging into the K-F case, Bridges said it had been discovered the firm was authorized to boost its ultimate production to 200 planes in September 1951 at an additional estimated cost of $17,106,400, which brought the price per plane to $713,000. By mid-1952, K-F was cut back to 159 Flying Boxcars with no reduction in total cost. Instead, the total cost increased again last December to $198,722,204, Bridges said.

Air Force expected K-F to complete 134 C-119s by May 1952, Gen. Cook told the subcommittee. The firm had completed only one plane by that date. He now expects K-F to complete its contract by March 1954. By April 30 this year Willow Run had turned out 44 C-119s. He said K-F has received more than $150 million since December 1950.

▶**Needless Waste**—Expanding on the procurement situation, General Cook said "the United States has been subjected to unnecessary expenditure of billions of dollars because of production highs and lows through the years. Until a firm policy is accomplished to assure steady aircraft and munitions production, there will be needless waste in defense production. Waste always accompanies haste."

"With a regulated system of letting contracts, we would have a long-range procurement policy and a fixed purchasing policy," the general said.

But in times of national emergency, such as 1950 when the Korean war broke out and the K-F contract was awarded, General Cook said "we have got to be sure we can get the aircraft first, then consider the costs."

▶**High Wages**—"At Willow Run we were not buying only aircraft, we were buying insurance against World War III. We expected to pay more for production than in the government-owned plant of Fairchild (at Hagerstown, Md.)."

Higher wage scales at Willow Run were given as another cause of the higher K-F costs.

General Cook admitted that before K-F was awarded the C-119 contract, he had favored using a government plant at Omaha or one at Chicago, as a second-source producer. At Omaha, however, the administrative facilities were occupied by headquarters offices of Strategic Air Command. The Civil Aeronautics Administration Communications control center was located in the Chicago plant and could not be moved easily.

Despite criticism of the K-F production record, General Cook told senators the Air Force has planned to use the Willow Run plant for production of the Chase C-123 when the C-119 contract is finished.

In earlier questioning, former Undersecretary for Air John McCone admitted he felt there was the possibility that K-F might try to have the Air Force absorb some of the losses of their automobile business and therefore would "have to be watched."

McCone said he was saddened and disappointed that the performance of the contract by K-F was an unsatisfactory one.

Last week the subcommittee was to meet in executive session to decide if further action is necessary. Indications were the K-F investigation might be dropped, since enough evidence has thus far been accumulated to satisfy the committee, Bridges intimated.

Comet Flight

Montreal—Royal Canadian Air Force's first Comet 1A made a 2¼-hour, 750-mi. press demonstration flight June 4, Ottawa-New York-Montreal-Ottawa. (George L. Christian, AVIATION WEEK's equipment editor, now touring Canadian aviation centers, was the only U. S. magazine writer on the flight.) The leg to New York represented the first flight over the U. S. of a commercial-type jet transport with full passenger load. The plane covered each leg in about half the time of present airline schedules, and consumed 2,584 imperial gallons of JP-1 jet fuel. RCAF is to take delivery of its second Comet this week.

UN Air Bases in Korea Open to Attack

(Editor's note: Censorship clearance of the following dispatch on lack of sufficient anti-aircraft at Far East Air Force bases barely preceded last week's climactic developments in Korean truce talks. Gen. Otto P. Weyland's comment, in adjoining columns, on the need for additional anti-aircraft units in the Far East adds significance to Correspondent Coughlin's report on the way in which bases lie open to treacherous attack.)

By William J. Coughlin

Seoul, Korea—U. S. air bases in Korea are wide open to attack from a Chinese Communist air force of more than 1,300 planes, mostly jets, poised just north of the Yalu River. Despite this constant threat, these bases lack adequate anti-aircraft protection.

Fifth Air Force and Eighth Army have asked repeatedly for sufficient anti-aircraft artillery without success. This could be as big a scandal as the ammunition shortage. If one thing in war is worse than no ammunition, it's no guns. Many Air Force officers believe U. S. air effort in Korea is endangered seriously by the shortage.

▶ **Vulnerable to Attack**—"I would like to have additional anti-aircraft units," Gen. O. P. Weyland, commanding general of Far East Air Forces, informed AVIATION WEEK in an exclusive interview. "If the enemy should attempt a large-scale effort against UN rear area establishments, additional anti-aircraft units would be necessary for adequate protection."

Situation is made worse by these facts:

- **Primary defense** against enemy aircraft is, of course, U. S. air power. But Fifth AF does not have sufficient fighter interceptor strength to stop a full-scale Communist air attack.
- **U. S. radar** is vulnerable.
- **Enemy air attack** could catch U. S. rear areas off balance.

This means anti-aircraft artillery protection is doubly important.

▶ **Parceled Defense**—Situation has been so desperate in the combat zone that Fifth Air Force and Eighth Army officials meet periodically to determine priorities by which limited anti-aircraft strength is parceled out to U. S. installations in Korea.

It can now be revealed that during the early part of the war, there was no U. S. anti-aircraft artillery whatever in Korea. The situation has improved somewhat but still is critical. At the end of 1952, after two and a half years of war, less than half of the top-priority defense areas in Korea had anti-aircraft protection.

Thus, a number of important U. S. air bases were among vital installations totally without ack-ack defense.

One dispatch on the shortage read:

"The need for additional AAA units is paramount. Due to the enemy's present and potential capabilities for launching a major air offensive, it is considered absolutely essential that our most vital bases and installations have a minimum effective AAA defense."

But such appeals brought little action. This is in strong contrast to North Korea, where quantity and quality of Red ack-ack have been increasing steadily.

▶ **Top-Level Attitude**—What is the explanation for a policy which has left U. S. Air Force in Korea in such a vulnerable position that some of its top leaders admit it could be driven from Korean skies if Communists decided to use their air power? One high officer at Fifth Air Force headquarters estimates it could be put out of action "within a week" by such an assault. Gen. Weyland is less pessimistic but admits: "If the MiGs came down in force, they would achieve some initial success."

Military observers here place at least partial blame for the situation on the top-level attitude uncovered by the Senate Armed Services Subcommittee during the ammunition inquiry in Washington. That investigation brought to light a directive issued by Secretary of Defense George C. Marshall on Sept. 27, 1950, which ordered the armed services to assume in drawing up budget estimates that the war would be over by June 30, 1951.

(Gen. Marshall said he acted upon the recommendation of the Joint Chiefs of Staff and there were hints that the White House might have had a hand in the affair. Sen. Harry F. Byrd has called the directive virtually a "slowdown order" on military preparations.)

This attitude was reflected in the Korean fighting. Visible effects of a reluctance to spend money for aircraft, airfields and guns which policy planners felt would not be needed can be seen today in Korea.

▶ **"Calculated Risk"**—Dispersal of aircraft is one problem created by such conditions. One Air Force general on Weyland's staff explained current thinking on dispersion this way:

Dispersion must consider two things:

- **Risk of enemy attack.**
- **Cost of dispersion** in terms of lost effective air power and money.

Under conditions in Korea, Air Force decided to take the risk, make full use of its offensive air power, save its money.

"They (the Reds) can blast us overnight," the general admitted frankly. "If they do, then we get the blame for guessing wrong. Our heads will roll."

It's what the military likes to call a "calculated risk."

▶ **Offensive Defense**—But enemy air attack would not find Fifth Air Force entirely unprepared.

"Occasionally, Gen. Barcus (commanding general of Fifth AF) calls up a squadron and tells it to move immediately to its alternate field in a 'safer' area," said Gen. Weyland. "It operates the day's missions from there and returns the next day to its regular field. This is just for practice. Of the forward fields, each has an alternate field. The fields farther south do not. Every outfit has an alternate place in Japan, however."

FEAF, unable to protect itself by bombing enemy bases north of the Yalu, nevertheless has kept Communists from moving jet fields farther south. Weyland keeps enemy airfields in North Korea "high up on my list" of targets, because such fields would give MiGs the range to strike deeper into South Korea.

"The Communists tried to build up their airfields about a year and a half ago and tried to establish three big jet fields at Namsi, Samchon and Taechon," Weyland said. "We knocked them out and have been knocking out their repairs. We have constant reconnaissance on those fields. As they start repairing, we go in and plaster them."

▶ **All-Out Attack**—But top Air Force brass in the Far East shudders to think what will happen if the Communists decide on an all-out attack with their potent air force, an attack which could include more than 1,000 MiG-15s and possibly might include 200 IL-28 jet bombers.

How might this long-feared Communist air attack take place? There is little question here that the Reds have the aircraft, personnel, air bases and logistic support for a full-scale coordinated air offensive against South Korea, launched without warning.

Here's how one competent Air Force official believes such an attack could come:

- **Initial assault** could be staged from

Korea Truce

Defense Secretary Charles Wilson said he "wouldn't advise any further letup" in the defense program as a result of a truce in Korea. "I am going to recommend we stay where we are." A truce in Korea appeared imminent as he made the statement.

Weyland Weighs Air Defense of Korea

Tokyo—Gen. Otto P. Weyland, commanding general of the Far East Air Force, issued the following statement exclusively to AVIATION WEEK *on problems of anti-aircraft defenses in South Korea.*

▶ **"The adequacy of anti-aircraft defense is dependent upon a number of related factors:**

• "The weight, aggressiveness and tactical skill of enemy offensive air.

"Since the time that AAA defenses were committed to South Korea, there has been no serious, hostile air effort against airfields, logistic facilities, or transportation; hence, there has been no test of the adequacy of AAA defenses.

• "AAA is but one of the means of defense against hostile air. Counter-air offensive operations are the best defense. We drove the enemy air out of North Korea and have prevented the establishment of any air bases from which enemy offensive air operations could be supported by escorting fighters.

"By the same token, within the permissible area of operations, we have carried the war to the enemy in his own backyard. The Communists, sensibly, have not seen fit to try to bring the air war to our backyard.

"Fighter aircraft, in conjunction with a radar control system, can intercept the enemy before he reaches the AAA protected targets, and, therefore, is the most effective means of active defense as long as we enjoy air superiority.

"In spite of our past and current success in keeping the enemy air away from our friendly air bases and other establishments, I would like to have additional anti-aircraft units. If the enemy should attempt a large-scale effort against UN rear area establishments, additional anti-aircraft units would be necessary for adequate protection.

▶ **"The efficiency of AAA, like any other kind of outfit, depends largely on practice and experience. In contra-distinction to Communist anti-aircraft, our units get no live practice or experience.** Our air units provide training for our own anti-aircraft units by furnishing 'tracking' and **'tow-target' missions.** This is necessarily limited in scope as such training missions simply subtract a comparable amount from our offensive air operations against the enemy. If our AAA got the same combat practice which the Communists have, their proficiency would certainly improve. However, I don't recommend this as the best way to solve the anti-aircraft defense problem.

▶ **"Anti-aircraft defenses are also correlated with early warning and passive measures of defense such as blackout control, dispersal of facilities, revetting, damage control and emergency procedures. Much progress** has been made through defense exercises; however, our relative freedom from air attack is bound to engender complacency and carelessness on the ground.

▶ **"There has been a steady improvement in our AAA capabilities and more is expected."**

the fields in the Antung complex—Antung, Ta-tung-kou and Ta-ka-san—plus two other Manchurian bases close to the border, Fengcheng East and Tapao, and possibly Sinuiji just south of the Yalu. Enemy aircraft could move in strength onto these fields under cover of darkness from bases in inner Manchuria and launch a classic dawn attack against South Korea.

• **Primary target** would be U. S. fighter bases, with paralysis of Fifth Air Force and Eighth Army headquarters a secondary objective. Outlying radar sites and aircraft carriers near the coast probably would be hit early in the attack, and attempts might be made to jam U. S. radar.

• **First wave** of the Red air strike would consist of many hundreds of MiG-15s sweeping across U. S. fighter bases at dawn. MiGs, to conserve fuel, probably would fly a direct route from Antung fields, coming in high, risking radar detection, rather than make a fuel-consuming low-level approach. This would give them 10 min. on the deck in the Seoul area.

• **Piston fighters** (which could include up to 250 LA-9s, LA-11s, YAK-9Us and YAK-9Ps) could come in at low altitude to avoid radar detection but probably would be in the second wave, after MiGs had taken care of U. S. jet fighter opposition. YAK-9U has the range to fly a devious route to the target, but others would have to come direct.

• **Third enemy wave** would consist of bombers, with a hard core made up of IL-28 twin-jets, of which more than 100 are reported in Manchuria. The Chinese also have available 220 other light bombers, mostly of the TU-2 type. Bombers could fly direct route to targets if all went well in early stages of the attack.

Reds have sufficient jet fighters available to provide air cover almost continuously for such a strike.

▶ **U. S. Complacency**—U. S. radar stations might pick up the approaching aircraft and flash the alert to the air raid warning center in Seoul. Attempts would be made to scramble F-86s and F-94s to meet the attack, but due to high speed of the approaching jet aircraft, it is unlikely any but a few Sabres standing on strip alert at dawn would get off the ground before the Reds hit.

Under present conditions in Korea, 15 minutes would hardly be sufficient warning to meet a major Communist air assault. U. S. air and ground forces have lived with the unfulfilled threat of Red air attack for so long, they possibly would be caught off balance.

"Our relative freedom from air attack is bound to engender complacency and carelessness on the ground," Gen. Weyland said.

▶ **Hard-Pressed Sabres**—Reds have the ability to launch the attack. Against this potential effort, until five months ago, Fifth Air Force could put up only two wings of first-line fighter interceptors, less than 150 F-86 Sabre jets.

Despite their superiority over Russian-built fighters in the limited MiG Alley air battles, the Sabres would be hard-pressed by such great swarms of MiGs even if the majority of the F-86s could get airborne.

It has been estimated that a surprise attack might knock out half of the Sabres while they were on the ground.

▶ **Sounder Balance**—Air Force recently revealed that at least one fighter-bomber wing in Korea now has been equipped with Sabre jets. Fifth Air Force thus increases its first-line day fighter strength without increasing the number of wings in action in Korea.

If the new F-84F Thunderstreak replaces F-84s now in action in fighter-bomber work, AF would have another aircraft in Korea possibly capable of holding its own with the MiG.

Thus, since Communist air strength in Manchuria appears to be leveling off, Fifth AF could look forward to a sounder military balance with the Reds even without increase in size.

Arrival of new Navy fighters also might help the situation.

▶ **Reasonable Capability**—Gen. Weyland, with his forces strengthened by arrival of the additional F-86 Sabres, is not unduly concerned over the possibility of a major Red air attack and believes his fighters provide reasonable defensive capability.

In Tokyo, he analyzed the situation this way for AVIATION WEEK:

"If the MiGs came down in force, they would achieve some initial success, but if they endeavored to sustain it they would lose their air force in the attempt. I doubt that it would be neces-

sary to reinforce Fifth Air Force from Japan, but we could. We also could draw from Okinawa and the states.

"MiGs don't have the range to escort bombers beyond Seoul and some advanced air bases. Propeller-driven and jet bombers could go almost anywhere in South Korea, but without MiGs to cover them. Any fighter-bomber we have could handle it."

▶ **Red Guerrilla Lookouts**—Present conditions in South Korea are no secret to the Communists. Guerrillas are active in the vicinity of U.S. airfields.

B-26 pilots flying from a base in Southwest Korea, far behind the front, report they occasionally receive more battle damage from guerrilla small arms fire during landings and takeoffs than they do from Communist flak north of the bomb line. Ambushes along roads near American bases are not infrequent.

Radio-equipped Red guerrillas hidden in hills overlooking U. S. air bases can count number of anti-aircraft guns, number and types of aircraft, location of radar sites, and transmit this information north.

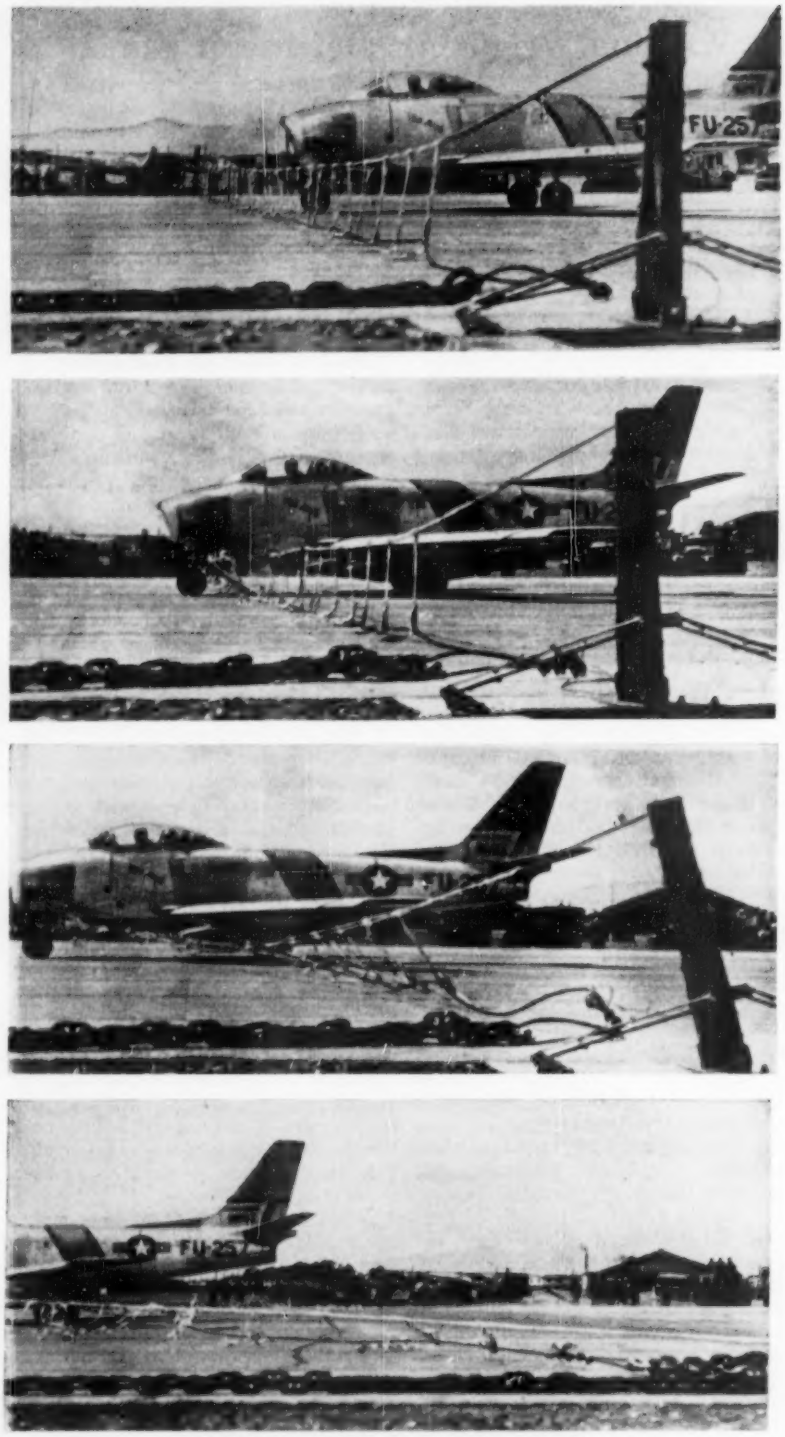
▶ **Authoritative Guess**—With South Korea thus vulnerable, why haven't the Communists used the air power based north of the Yalu? Why haven't the MiG-15s, IL-28s, TU-2s come south in an attempt to drive Fifth Air Force from Korea?

One of the most authoritative guesses—and any answer is at best a guess—comes from a high Air Force officer in Tokyo with many months of service in the Far East, who believes the Reds are holding back for one or all of four reasons:

- **It would expose** the fact that a great number of Russians are flying in the air war. One Red pilot shot down at sea was strafed by his own comrades before approaching U. S. rescue units could reach him, presumably because he was a Russian.
- **Russians do not trust Chinese** out from under their thumb, are reluctant to allow them to commit the Russian-built Chinese air force that far south.
- **Chinese are afraid U. S.** will use the atomic bomb against Manchuria in retaliation.
- **Communists, like U. S.,** do not wish to expand the war in the Far East, which a full-scale air assault against South Korea would do. It's a good bet, this officer believes, that if the Reds unleased their air power, U.S. would lift the Yalu River restriction.

But if such a Communist air attack did come, it would find the U. S., even after three years of war, far from ready.

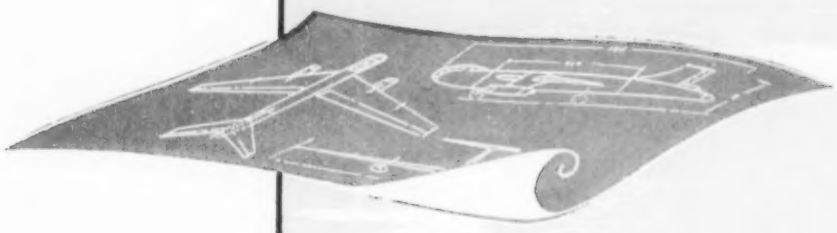
"We have asked for more AAA than we've gotten but this has never been a problem because we've never been attacked," warned Gen. Weyland. "It could be a problem."



CRASH BARRIER FOR AF JETS

To keep aircraft from rolling off the end of the runway on landing or when they fail to become airborne on takeoff, Air Force has installed crash barriers, like the one pictured above, at two bases in Korea. This dramatic photo sequence shows such a barrier being tested in Japan. From top to bottom: An F-86A Sabre jet fighter heads into the barrier at approximately 140 mph.; its nose gear then goes through the nylon net, triggering an arresting cable, which in third photo engages the main landing gear. At the bottom, the cable is stretched taut and begins to drag heavy chains stretching along the sides of the runway, slowing the jet's roll. The net costs approximately $140,000.

MODERN PLANES DEMAND GOOD CONTROL CABLE



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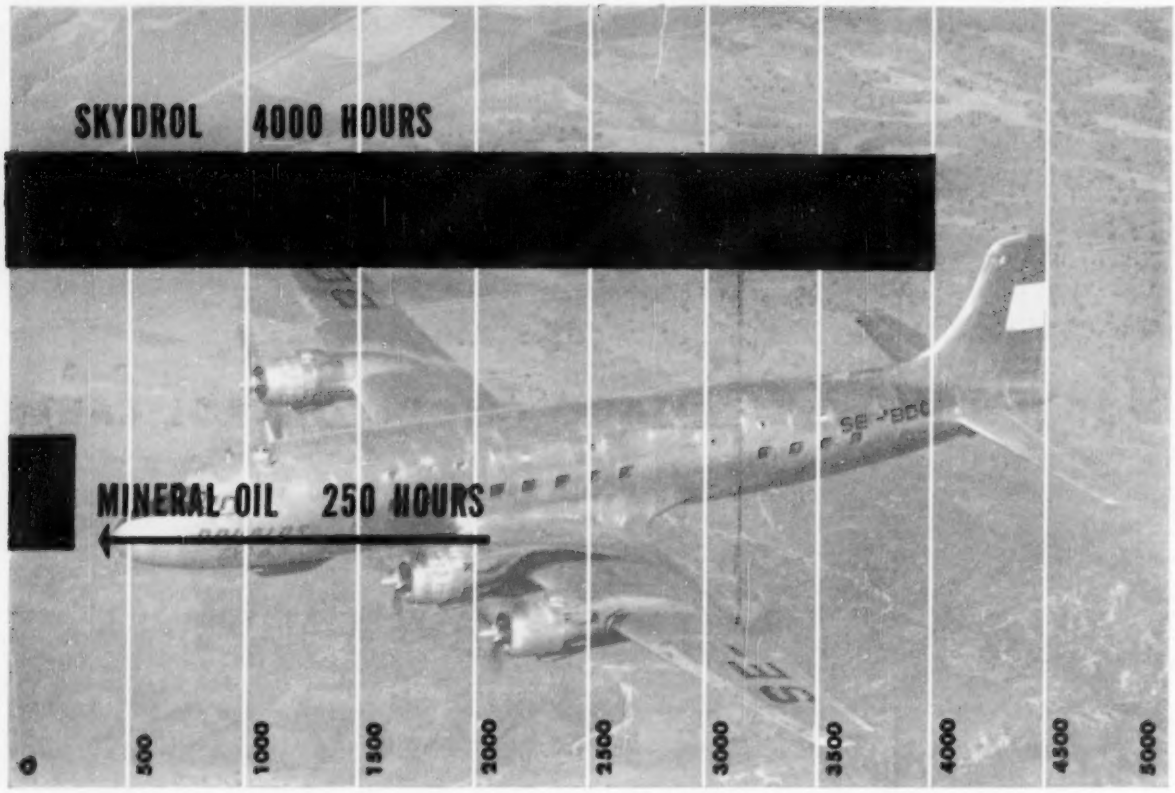

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Engineer Cites Need For Better Airports

Impressive gains made in speeding larger numbers of transports into and out of big terminals using more and newer navigational aids will be lost unless proper taxiing, berthing and handling facilities are developed, Earl M. Rader, Miami consulting engineer, told a recent convention of the American Society of Civil Engineers.

"The ground facilities within the airport boundaries are the major bottleneck in air transportation today," Rader said, noting that big-city airports are particularly vulnerable because of their use as terminal and change-over points.

More thought should be given by airport operators toward developing all possible acreage not needed for flight activities into sites for factories, assembly plants and similar industry to bring in extra revenues and offset high operating costs, Rader said. Need for keeping design of airport pavements up with progress in larger, faster jet transports was cited by consulting engineer John G. Rakowsky, also of Miami.

Italians Deliver Thunderjet Parts

(McGraw-Hill World News)

Rome—The first of 1,600 different replacement parts for Republic F-84G Thunderjet fighter-bombers being used by North Atlantic Treaty Organization nations have been delivered by the d'Arco aircraft plant at Pomigliano, Italy.

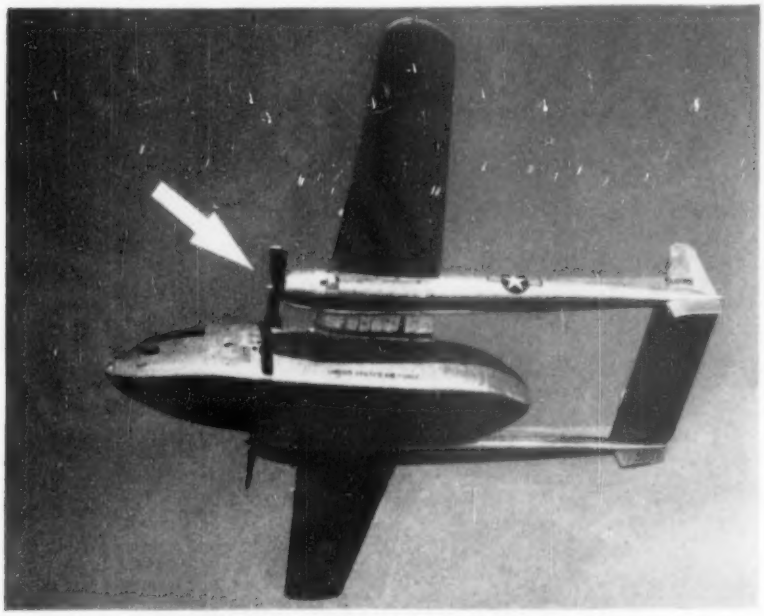
Initial deliveries were made 370 days after the necessary licenses had been approved by the United States and 343 days after receipt of contracts from the United States Air Force in Europe. The new supplier's plant covers approximately 582,000 sq. ft. It is the only firm approved to make Thunderjet parts in Europe.

Caribbean American Faces Revocation

Civil Aeronautics Board examiner J. L. Fitzmaurice recommends that the Board revoke the letter of registration of nonsked Caribbean American Lines for flying too frequently.

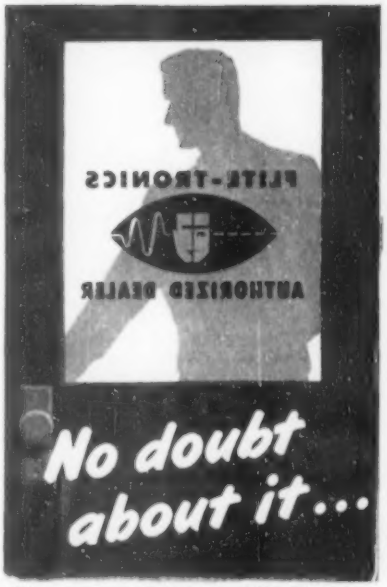
In the year and one-half to Dec. 31, 1952, the carrier flew 386 flights New York-Los Angeles, 360 Los Angeles-New York, 383 Los Angeles-Chicago, 400 Chicago-Los Angeles, 415 New York-Chicago and 415 Chicago-New York.

The examiner says, "The operations conducted by respondent have exceeded all bounds of irregularity promulgated by the Board governing the services of irregular carriers." He also finds that the carrier "has provided transportation to persons who were issued tickets which did not comply with the form prescribed by Section 291.24 of the Board's economic regulations."



FAIRCHILD PACKET FEATHERS ONE

Fitted with new Aeroproducts square-tipped propellers, Fairchild C-119G Packet peels off to the right with its port prop feathered (arrow). Feathering-in-flight is part of normal test program for the C-119. The Aeroproducts propeller recently was adopted as standard equipment for the C-119G Packet transport series.



Pilot reports boosting Flite-Tronics equipment are bringing increasing numbers of professional pilots and pilot-owners to Flite-Tronics dealers everywhere. The MB-3 Marker Beacon Receiver and CA-1 Audio Distribution Amplifier are demonstrated first-hand so that these "seeing and believing" pilots know, without a doubt, they are buying the very best! See *your* Flite-Tronics dealer soon!

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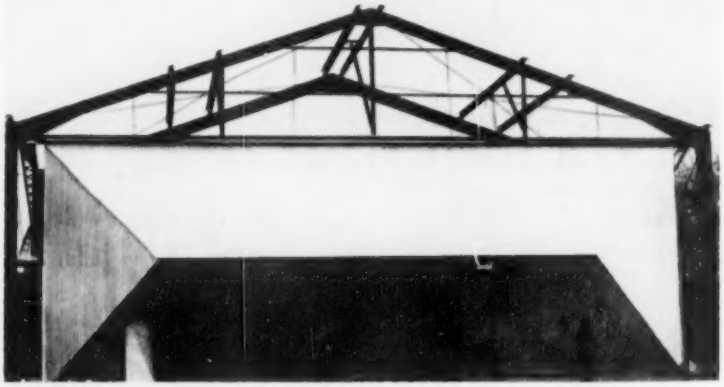
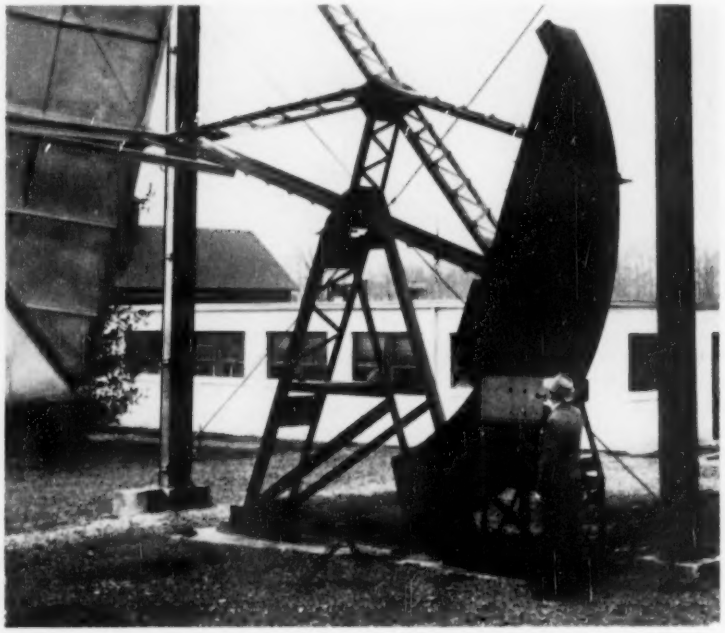
Aviation Week Picture Brief



FRONT VIEW shows roof-like appearance of counterbalanced door of new "alert hangar" developed for USAF fighters by Luria.

New Alert Hangar for USAF

Latest of the growing group of "alert hangars" developed for the Air Force is this unit built by Luria Engineering Co., Bethlehem, Pa. The electrically operated five-ton door can be opened in 30 seconds or less, allowing a jet interceptor to become airborne in less than two minutes, according to the firm. In case of power failure, a hand crank (at man's right in picture below) can open the counterbalanced door in about a minute and one-half. Air Force now has three of the units—one built by Luria and two built by other contractors from parts supplied by Luria. The actual design ordered by USAF contains four side-by-side sections or compartments (each for one interceptor) and a compartment in the center with briefing and ready rooms. The fighter compartments each have two doors, one front and one rear. Framework of the alert hangars is steel; walls, doors and roof can be corrugated steel, aluminum or asbestos, as desired. Complete unit is put up in about six weeks.



REAR VIEW of demonstration unit exposes rack and pinion arrangement (right) that can open the five-ton door in half a minute.

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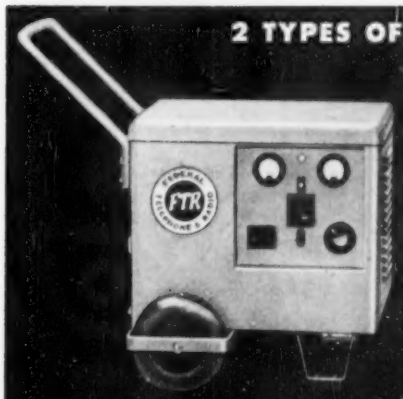
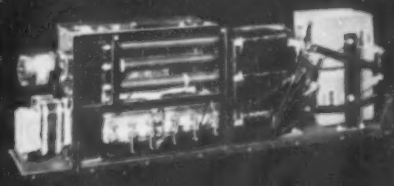
2 TYPES OF FEDERAL GROUND POWER SUPPLIES





FTR-3438 *Meets MIL-P6905 and applicable portion of BuAer-38A1B9-C.* Output voltage fixed at 30 volts, 200 amps. Adjustable to 26.5 to 31 volts, 200 amps. Input – nominal 200 volt; 400 cycle. No moving parts. Tests show this equipment far surpasses performance of comparable units now in service.

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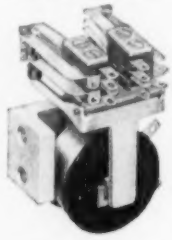
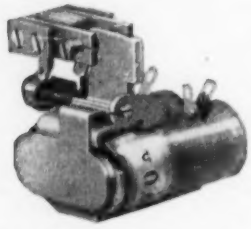
Extra Rugged, Compact 400-Cycle AC Relay Offered in New AF Series

New AF Series, recently developed by Potter & Brumfield, will operate on any frequency in the general vicinity of 400 cycles with 15 grams or higher contact pressure at approximately 2 VA input per movable pole. Advanced construction withstands better than 10-G vibration with any contact arrangement up to 2 Form C (DPDT) contacts.

New unit is available open as illustrated or hermetically sealed with 3-stud mounting and plug-in or solder-terminal glass-insulated header. Coils wound on molded bakelite bobbins with breakdown of 500 V. RMS minimum between all current carryingelements and to ground. Contacts rated 5 amps, 115 volts, 60-cycle, non-inductive load.



Ultra-Sensitive SS Series Feature Dual Coils; 10-G Vibration Resistance

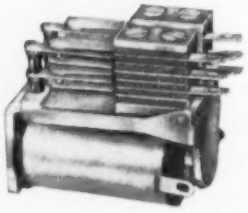


Brand new SS Series, DC Super-Sensitive Relays, provide operation with 10-G vibration resistance on less than 10 MW. New unit utilizes dual coils normally connected in series. Balanced armature with point bearings pivoted in adjustable mounts reduce friction to a minimum. Pure silver contacts rated 2 A at 115-V. AC or 28-V. DC, non-inductive load. Contact arrangement is 1 Form C (SPDT). Available with total coil resistance up to 60,000 ohms and sensitivity range from 1 MW to 2 W. Supplied open as illustrated or hermetically sealed with glass-insulated plug-in or solder-terminal header.

Design Engineer Gets More Help to Meet Tough Relay Requirements

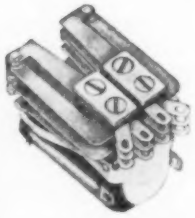
Shown on this page are some of Potter & Brumfield's recent relay developments. Constant creation of new relay structures offers today's design engineer more help in his search for miniaturization, ruggedization, acclimatization, higher contact capacities, more contact combinations, greater sensitivity and longer life.

MH Series Offers Maximum Conversion Efficiency; Many Contact Combinations, DC or AC



Smallest and most versatile of the telephone type relays, MH Series offers maximum coil power, a wide selection of contact combinations and high contact capacity. Available open or hermetically sealed with maximum of 12 contact springs for either DC or 60 cycle AC operation.

MJ Series Feature Longer, More Flexible Contact Arms; Lower Spring Load Rate, DC or AC

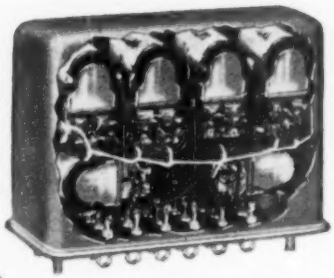


Newly developed MJ miniature telephone type relay features longer and more flexible contact arms which result in a lower spring load rate. This structure permits wider contact gap, more overtravel, improvement in sensitivity, faster action and longer life. MJ supplied open or hermetically sealed, with maximum of 12 contact springs, for either DC or 60 cycle AC operation.

Coils for both relays furnished up to a maximum resistance of 22,000 ohms for either current or voltage actuation. Insulation resistance better than 1000 megohms and breakdown above 500 V. RMS.

Hermetic Sealing or Dust Covering Available for All Individual Relays or Multiple Groups; Keep Out Dust, Fumes, Moisture, Etc.

- New "L" Type deep-drawn steel enclosure accommodates six MH relays or one standard LT telephone type relay, not shown on this page. Mounting is by 4 studs. Available with maximum of 24 solder terminals. Dim. $2\frac{5}{16}$" x $4\frac{11}{16}$" x $3\frac{5}{32}$" high.



- New "D" Type deep-drawn steel enclosure is designed for sealing the AF Series 400-Cycle AC relays, but will accommodate the MH or MJ relays shown above. Supplied with standard octal 7, 9 or 14 pin miniature plug or up to 14 hot-tinned solder terminals. Dim. $1\frac{5}{16}$" x $1\frac{29}{32}$" x $2\frac{9}{16}$" high.

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WHAT'S NEW

New Publications

A Short-Term Training Program in an Aircraft Engine Plant, bulletin issued by Department of Labor, describes how a firm trained machine tool operators, including a large number of women, to meet its defense requirements. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C. Price 10 cents.

Airtab is a handy little pocket-size spiral-bound publication aimed to aid pilots in flight planning and for keeping valuable notes. There are sections on meteorology, radio, navigation, emergency procedures and addresses and phone numbers. Airtab is priced at $1 and available from Nimbus, Inc., 2014 Holly Lane, Falls Church, Va.

Products Literature

Subminiature indicator lights made to mount in a ⅜-in. clearance hole are detailed in Brochure L-153. Data are included on models for plastic plate edge lighting, non-dimming indicators, mechanical or Polaroid dimmer types, light shield and indicator lights with press-to-test feature. Write E. Greene, Dalight Corp., 58 Stewart Ave., Brooklyn 37, N. Y.

Complete switch line and data on single- and double-pole switches meeting AN and aircraft specs are covered in 10-page catalog available from Carling Electric, Inc., W. Hartford, Conn.

Civil aircraft equipment made by Radio Corp. of America is described in catalog sheets released by the company. Included are complete descriptions of AVR-22 general purpose communications receiver, AVT-49 low-frequency transmitter and AVQ-6 radar low-altitude altimeter. Write Aviation Radio Equipment Section, Engineering Products Dept., Radio Corp. of America, Camden 2, N. J.

The Why and How of Hermetic Sealing for electrical and electronic components and assemblies is a new folder being distributed by General Hermetic Sealing Corp., 99 E. Hawthorne Ave., Valley Stream, L. I., N. Y.

Circuit selectors and stepping relays are described in Bulletin 353 CSR. It includes method of operation (selective and stepping), cascade master-slave homing circuit diagram, spark suppression, types of mountings, rectifiers and remote selsyn circuit. Available from

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Ideal for lighting mountain peaks, promontories, buildings, towers. Battery-operated, 90 flashes per minute, visible for 20 miles in clear weather. Will operate up to 9 months on 2 dry-cell batteries. Automatically turns "off" at daylight and "on" at dusk.

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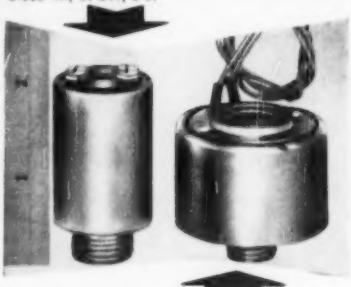
407 Commercial Center St. • Beverly Hills, Cal.

ACCURATE MINIATURE
SOLENOIDS FOR THE
AIRCRAFT INDUSTRY

Model SD-128, at the left, is a pull type solenoid. It is a continuous duty unit designed to pull 4 lbs., 0.062 in., at 24v, d-c.



The push type solenoid, Model SD-73, pushes 20 lbs., 0.025 in., at 24v, d-c. This unit is useful for actuating valves and for other applications requiring short strokes. A threaded plunger adjusts stroke to an accuracy of plus or minus 0.002 in. The plunger can also be re-postioned up to 0.125 in. from normal position.

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Largest manufacturer on the Pacific Coast producing aircraft quality solenoids exclusively

Micro ball bearings in 137 models, in bore sizes from .025 to ⅛ in. and outside diameters from .100 to .5 in., are covered in catalog available from New Hampshire Ball Bearings, Inc., Peterborough 1, N. H. Use letterhead.

Hermetically sealed relays for electronic applications are detailed in Bulletin GEA-5729A being distributed by General Electric, Schenectady 5, N. Y. Relays are designed to meet provisions of MIL-R-6106 and performance requirements of MIL-R-5757B.

Teflon spiral rings, used in backing up O-ring seals in hydraulic and pneumatic systems, especially at high temperatures, are described in four-page bulletin available from Resistoflex Corp., Belleville 9, N. J. Data is also given on Fluoroflex-T rod, sheet and tube stock produced by the firm from Teflon powder.

Tenneyzphere altitude chambers, capable of simulating conditions from sea level to approximately 80,000 ft., temperatures from −100F to 200F and humidities from 20 to 90%, are covered in four-page bulletin being issued by Tenney Engineering, Inc., 26 Avenue B, Newark 5, N. J.

Standard permanent magnets, available in Alnico 2, 3 and 5 for use in producing experimental working models of devices, for moderate production runs or standard applications, are listed in Catalog 1252 available from Thomas & Skinner Steel Products Co., Inc., 1152 E. 23d St., Indianapolis 5, Ind.

Publications Received

• **Flight Engineering Manual**, by Charles A. Zwing, published by Pan American Navigation Service, North Hollywood, Calif., $4.00. Second edition of flight engineers' guide. Has been completely reset and revised to include current developments in aircraft, instruments, powerplants, and standard flight engineering practices.

• **The Aircraft Commander in Commercial Air Transportation**, by Dr. M. S. Kamminga, pub. by Martinus Nijhoff N. V., 9 Lange Voorhout, The Hague, Netherlands, $10.00. A study which may prove to be an important contribution toward conclusion of a convention granting the aircraft commander a legal status in keeping with his responsibilities.

• **The High-Speed Internal-Combustion Engine**, by Sir Harry R. Ricardo, LL.D., F.R.S., pub. by Blackie & Son, Ltd., London and Glasgow, distributed in U. S. by Autobooks, 2708 Magnolia Blvd., Burbank, Calif., Fourth Edition, $11.00. Successor to earlier editions by an authority on internal-combustion engineering.

Ask the men with the most experience...

ask Ted Pavell

Chief Pilot, Allied Stores Corp., New York City

"After 19 years of flying, I guess I know the importance of consistent quality in aviation products," says Mr. Pavell, who's logged 6,000 hours. "I've seen how it pays off in terms of both dependable *performance* and money-saving *maintenance*.

"Our DC-3 is flown extensively throughout the United States, Canada, Mexico and the West Indies. Under all flying conditions, we've found we can put complete trust in Gulf dependability.

"That's been our pleasant experience with Gulf Aviation Products for the last six years."

Chief Pilot Pavell at the controls of the DC-3 owned by Allied Stores Corp., operators of well-known department stores throughout the nation.

For radial engines, or where a detergent oil is not desired, Gulf Aircraft Engine Oil, Series-R is a top-quality, non-detergent, straight mineral lubricating oil—approved by Pratt & Whitney and other radial engine manufacturers for all types of service. It retards sludge and carbon formation and retains its body at high operating temperatures.

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How Good Is the Custer Channel Wing?

- **Inventor says design improves performance.**
- **But NACA test results do not jibe with claims.**

By David A. Anderton

How good is Custer's channel-wing design? What can you get from the unique layout of half-shrouded propellers that you can't duplicate in some other manner?

For an answer, you can read Custer's claims in his company's brochure. You can check back to some of the doubts expressed in an AVIATION WEEK report on the plane made after a purported "hovering" demonstration (Dec. 17, 1951, p. 17). Or you can get a copy of National Advisory Committee for Aeronautics' Research Memorandum L53A09, and read some actual tunnel test results.

In any case, Custer's claims and NACA's test results do not jibe.

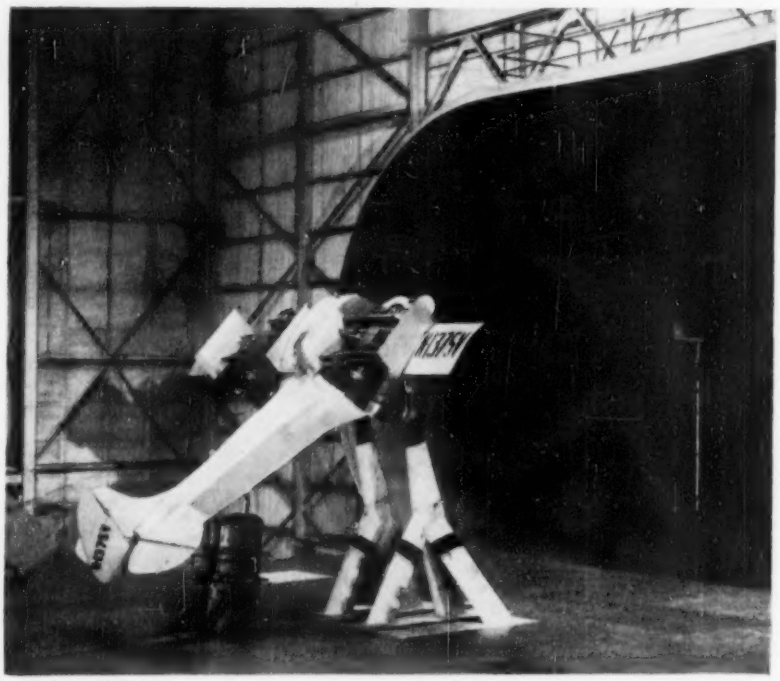
▶**Description**—The Custer Channel Wing looks like no other aircraft in the world today. The wings have been replaced with a pair of half-shrouds embracing the lower halves of a pair of propellers mounted near the trailing edge of the shrouds. Custer says that this layout results in the generation of static lift because the air is pulled over or through the channel regardless of forward speed.

Four basic claims are made for the channel wing idea in a company brochure issued by the Custer Channel Wing Corp. in February 1952. The brochure claims that a plane equipped with the wing will:

- "Take off in a few feet or rise vertically and hover if properly designed for such performance.
- "Attain forward speeds in excess of those of conventional aircraft.
- "Slow down, hover in midair and land vertically under full control.
- "Substantially increase payloads, flight range and endurance over that of any other ship."

▶**NACA Tests**—Now let's have a look at some of the results of the tests made on an experimental airplane supplied by Custer for tests in the full-scale tunnel at Langley Field.

The plane was similar to the one which gave the demonstration at the end of December 1951, with two exceptions. First, the uncovered fuselage of the plane was covered with fabric for the tests. Second, the engines of the plane were replaced with variable-speed electric motors because the engines were not adequately lubricated for operation at high angles of attack.



EXPERIMENTAL channel-wing plane is tested in NACA's full-scale tunnel at Langley.

NACA's prime objective was to study the static and lowspeed lift-producing characteristics of the channel-wing idea, and to study some stability and control properties at zero and low speeds at high angles of attack.

▶**Vertical Lift**—The airplane weighed in at about 900 lb. without the fuselage covering. The static lift developed under the full-power condition was 340 lb., the longitudinal force was 800 lb., and the nosedown pitching moment was −350 ft. lb.

The resultant force from this set-up was 880 lb. inclined at 23 deg. above the thrust line (which is also the channel-wing chord line).

In order to trim the airplane under this condition of flight, the negative tail lift required would further reduce the magnitude and the inclination of that resultant force.

Says NACA: "Thus, provided a suitable tail could be obtained for the airplane to provide the negative tail force, the airplane, in order to hover, would have to be inclined at some angle greater than 67 deg. and the weight would have to be less in magnitude than the resultant force."

The resultant force, incidentally, was about 88% of the static thrust calculated for the propellers operating without the channels.

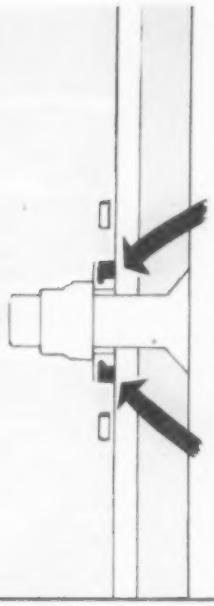
▶**Lift Improved?**—NACA engineers tried some variations in the basic geometry aimed at improving the static lift. But propeller position seemed to have no effect on static lift, and neither did an extensible leading-edge flap. The use of an extended trailing-edge flap did improve the lift by about 25 lb.

Increase in wind speed increased the lift of the wing, but this would only apply during forward flight, and not during any hovering condition.

▶**Channel Flow**—During these studies, the flow in the vicinity of the channel was checked.

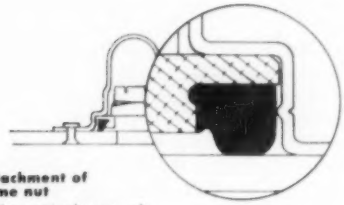
Custer says: ". . . Success of the Custer Channel Wing is due to controlling the boundary layer or turbulent flow above the surface of a wing and more specifically to the boundary layer disturbances at high speed. By maintaining a laminar flow at all times, top speeds are greatly increased. . . . Although no auxiliary devices whatever

fluids can't penetrate this barrier



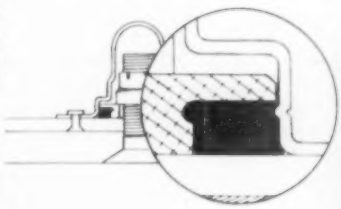
IN THIS SELF-SEALING DOME NUT

4630H SERIES



Attachment of dome nut

During attachment of dome nut, seal retracts into shell, but remains in contact with the structure. This eliminates pinching and subsequent cold flow of seal due to gaps which may exist between shell and the structure.



Installation of bolt

Installation forces the bearing surface of sealed washer to contact the structure, providing positive single point sealing.

Provides:

- ★ **High pressure sealing without sealing compounds**
- ★ **Inseparably self-contained assembly**
- ★ **Single point seal**
- ★ **Floating nut with stationary seal, unaffected by successive bolt installations**

Reduces Installation Time, Weight and Maintenance

Because seal is self contained, no sealing compounds are used resulting in reduced weight. Necessity for maintenance is almost eliminated.

SPECIFICATIONS

Self locking nut conforms to applicable requirements of AN-N-5. Available in 10-32 NF-3 and ¼-28 NF-3 thread sizes. Floats .025 in all directions.

Self contained seal conforms to applicable requirements for aircraft fuels type 1, 2 and 3 per specification MIL-R-6855. It is resistant to atmospheric elements, salt water, oil, gasoline and most organic solvents. Applicable temperature range: −80°F to +225°F constant or fluctuating operation. Applicable pressure range: ±50 psi constant or fluctuating operation.

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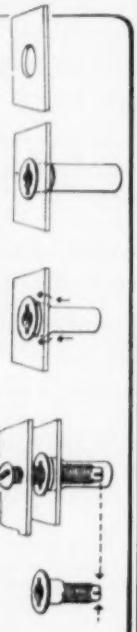
THE BLIND ANCHOR NUT OR/RIVET

ONE MAN INSTALLATION IN SECONDS

THE AVIATION STANDARD
for Screw Locking Anchor Nut Uses and Metal to Metal Fastening.



1 Drill one (1) hole.

2 Insert Lok-Skru with either Hand or Power Lok-Skru Tool.

3 With Lok-Skru Tool draw barrel over shoulder of Lok-Skru and flush with metal. This provides a Blind Anchor Nut for Secondary Attachments.

4 TO FASTEN ATTACHMENTS insert standard Machine Screw through hole in attachment and into Lok-Skru. As machine screw is tightened into Lok-Skru it is securely locked by means of the "Specially Crimped" locking-end of the Lok-Skru.

Crimped internal threads of Lok-Skru provide secure locking device for attachment screw.

Write for Folder
Handy information on the many uses and application of Lok-Skrus in airplane construction with complete data on types and sizes.

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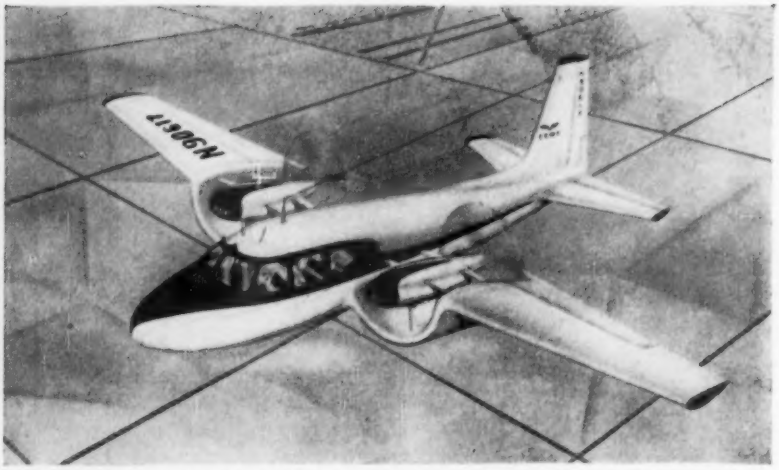


ONE PROPOSED APPLICATION of the Custer channel wing configuration is the CCW-5, which would combine a Baumann Brigadier airframe with the unusual wing.

are used, the boundary layer is controlled at high speeds and turbulence and stall are eliminated at low speeds."

But the tests show differently. For zero forward speed, the flow through the channel is rough and partially in a stalled condition. At a low forward speed of about 27 mph., roughness began at the trailing edge below 18 deg., spread to a stalled condition over about 40% of the channel at 25.2 deg., and by 30 deg. was almost completely stalled.

One unusual aspect of the flow near the channel: At the top of the propeller disk, airflow is from the downstream face in a reverse direction. With the prop operating in non-uniform flow, NACA says that its loading is asymmetrical and its efficiency is lowered.

► **Lift Coefficients**—To get a direct comparison of lift coefficient, NACA based the reduction of data on the channel-wing area alone, and then on the conventional gross wing area, including ailerons and intercepted fuselage area.

Custer has claimed an infinite lift coefficient in static condition; NACA says that this is not unique for the configuration but would apply to any aircraft which approached the hovering condition. (Lift coefficient is inversely proportional to the square of the velocity. As the speed approaches zero, so does its square, and the value of lift coefficient must increase tremendously. The real test in this case is the actual lift obtained, not the coefficient.)

Values of maximum lift coefficient for low speeds are ". . . comparable with those normally attained by conventional airplanes with thick wings and without high-lift devices," says NACA.

► **Safety Claims**—The company's brochure claims ". . . complete control in yaw, pitch and roll at low speeds—an advantage not found in any plane. This is particularly important for control of the ship if the power fails. . . . Glide characteristics are comparable with conventional ships."

But the tests found a large variation in static longitudinal stability over the angle of attack range, and this means a serious problem of control at low airspeeds.

Says the NACA memorandum: "The untrimmed pitching moments are large and . . . cannot be trimmed with full control deflection."

Still on the subject of control, there was a slight asymmetry of thrust discovered during the forward-flight tests. This amounted to about a 25-lb. differential, but it required full rudder to trim out the airplane. For single-engine operation, ". . . . the aerodynamic controls would, therefore, be completely inadequate and flight would not be possible with single-engine operation," according to the NACA report.

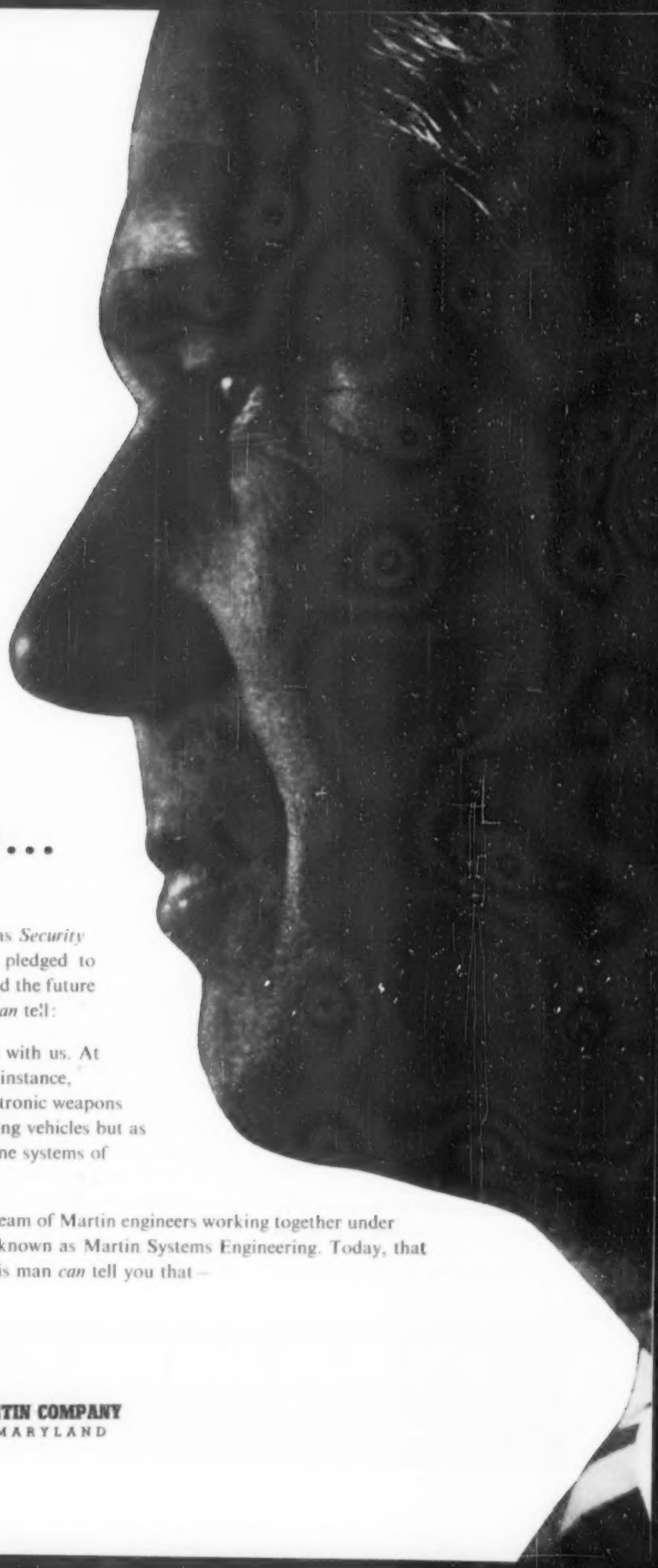
This would seem to refute the claims of complete control made for the channel wing.

► **Glide Performance**—Here's what NACA has to say about the design glide performance: "Since single-engine flight provokes such serious problems that power-off landings would be required in event of failure of one engine, it is of interest to note that the maximum power-off lift-drag ratio for the configuration tested is very low (about 1.7). . . ."

Using the lift-drag ratio as a measure of the glide-path angle with power off, you get a glide angle of 30.5 deg. This figure is not at all comparable with conventional aircraft.

The NACA report makes the flat statement that the controls were completely inadequate under static lift conditions, and the airplane could not be flown in hovering flight.

This all adds up to almost complete



If this man were free to speak...

Much of his thinking is classified as *Security Information*. Much of his mind is pledged to silence, for the love of his country and the future of our world . . . But this much he *can* tell:

Already the dawn of a new world is with us. At The Glenn L. Martin Company, for instance, new aircraft, guided missiles and electronic weapons are being designed not as today's flying vehicles but as coordinated and controlled spaceborne systems of tomorrow.

Behind that work is a powerful new team of Martin engineers working together under an entirely new concept of avionics known as Martin Systems Engineering. Today, that story is under security wraps, but this man *can* tell you that—

You will hear more about Martin!

Martin AIRCRAFT

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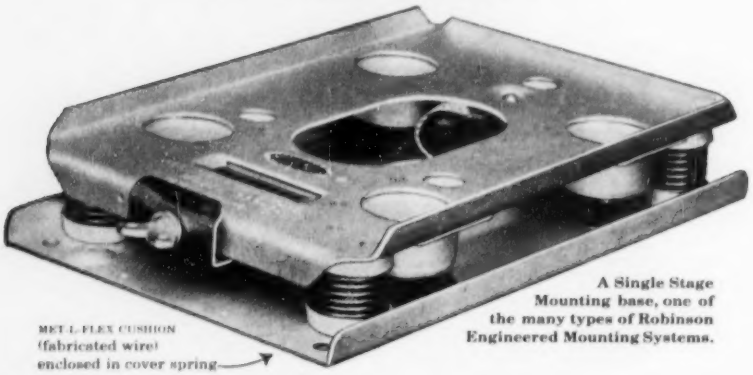
Vibration and Shock Control Mounts
SET NEW RECORDS of DURABILITY



A Single Stage Mounting base, one of the many types of Robinson Engineered Mounting Systems.

Robinson Engineered Mounting Systems and Unit Mounts are **the most durable ever built** for airborne equipment. They employ an all-metal, load-carrying cushion, MET-L-FLEX*, which is formed in such a way that all wires are continuous from top to bottom. These cushions are inherently and permanently damped. They do not require external damping devices.

MET-L-FLEX cushions properly installed in Robinson Systems do not and cannot set or pack. They are correct in theory, durable in practice.

Long Service Record

AMERICAN AIRLINES, INC., has used Robinson Mounts and Mounting Systems for three years in its ***Flagship Fleet,*** and reports that not one replacement has been required during this period. This represents a service life nine times as great as mounts previously used.

Robinson Mounts are designed and built for the operating life of the aircraft and the equipment on which they are used.

Their long life and durability result in important savings of time and money for replacements.

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Specified and used by hundreds of leading electronics, aircraft and industrial manufacturers, *Robinson Mounting Systems offer a proven solution to today's problems of vibration and shock.*

For more facts and information write for the new Visualizer Bulletin No. 750-AW.

**MET-L-FLEX is the copyrighted designation for the all-metal resilient cushion developed and pioneered by Robinson.*

ROBINSON AVIATION INC.
TETERBORO, NEW JERSEY
Vibration Control Engineers

deflation of the claims made by Custer. According to the tests, the plane will fly, but it won't hover. Control is poor in forward flight, and flow through the channel is rough and partially stalled. Single-engine operation would be impossible, and the power-off glide-path would be very steep, not at all comparable to today's aircraft.

THRUST & DRAG

For the record, Convair was the first firm to fly a delta-wing powered airplane. The date was Sept. 18, 1948, and Sam Shannon—who is now testing the radical Convair delta-wing Sea Dart—was at the controls. The plane was Convair's Model 7002, later to be redesignated the XF-92.

Let's repeat that first sentence: Convair was the first firm to fly a delta-wing powered airplane. Why all this emphasis? I'm growing rather tired of hearing England credited for the entire development of the flying triangle. Last year at Farnborough, the announcer said that Britain was the first to fly a delta-wing plane; this month the Hawker Siddeley Review, house organ of the group, says, ". . . delta-winged Vulcan bomber which gave Britain the world lead with this type of aircraft." Another quote, same article: ". . . in Manchester the world's first practical delta-wing aircraft was designed and built."

We repeat, Convair was the first.

* * *

"Well, they fired the atomic cannon," said the engineer, "and it puts me in mind of the old cartoon of a couple of scientists standing in front of a gigantic engine they'd just finished. One of them says, 'There it is—one million horsepower. Now what the hell are we gonna do with it?' That's the way I feel about this Army cannon."

"Elaborate," I said, trying to get the waiter's attention.

"I always look for an ulterior motive in something like this, and I believe that the Army just wants in on atomic warfare, just like they want in on long-range guided missiles." He twisted the empty glass, drained the last drop.

"But aside from ulterior motives," he said, "it still doesn't make much sense. You take an A-bomb and wrap the thing up in a shell to fire from an 85-ton monster that's gotta be dragged up through the muck real close to the enemy.

"Furthermore, you're not gonna be able to fire it with just any old crew. You gotta have an elite crew, maybe with half-a-dozen guys from the AEC sitting around to hold hands while loading is going on. Then you don't want to get too near the front where some

HAVE YOUR FASTENING METHODS

kept pace?

It's a big jump from XVIII century fire-balloons to the jets that flame across our skies, today . . . and design changes never stop. That's why it pays to have your fastening methods checked by trained specialists . . . constantly.

Specialized fasteners, engineered by Monadnock for all types of aircraft,

★ Speed Assembly ★ Ease Maintenance
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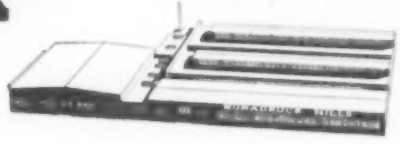
Monadnock, with a wealth of fastening experience, also has reliable development and production facilities available to manufacturers of other quality products.

MONADNOCK MILLS San Leandro California



Subsidiary of UNITED-CARR FASTENER CORP.

A Salute

TO THE LOW-FLYING MEN!

All hail to the ace in the "wild blue yonder" . . . but let's give with some man-sized cheers for the lads who slug it out at hill-top level. From the time they take off . . . till the mission is completed, these strategic fighter bombers and tactical close support pilots face a brutal blasting all along the way.

➢ ➢ ➢ Sniped at by small arms and machine guns . . . bracketed by flak with the constant hazard of limping home harassed by enemy aircraft . . . these are the stout warriors for whom we've planned Republic's rugged THUNDER-craft . . . to get them there . . . do the job, and bring them back.

REPUBLIC AVIATION

FARMINGDALE, LONG ISLAND, N. Y.

Makers of the Mighty Thunderbolt · Thunderjet · Thunderstreak · XF-91

sharp boys from the other side can call in tactical aircraft and clobber the entire cannon caravan before they get off a shot.

"And as for this business of firing regardless of weather, I say it's bull. Artillery gets targets spotted for it right now by airplanes—although the Army hates to admit it—and if you can't see to spot, you're just not shooting that day."

"I like the reasoning," I said.

"It figures. Right now we've got a zillion tactical aircraft that can carry atomic bombs. They can operate from decent conditions far enough back to maintain security. They can fly over, unload on the enemy and fly back. Nobody gets a chance to report in a five-mile caravan moving a heavy object up towards the front—they're already hit by the time they catch on to what's about to happen. No sir, pal, if I got to pay for A-bombs, I want to have some say about the delivery method.

"I want 'em sent airmail, not by the overland stage."

* * *

Award for the Induced Drag Coefficient of the Week—and it's the biggest one so far—goes to those government officials who insist on cutting back research and development money. They did it with the NACA and they're trying to do it with the Air Force.

How long is it going to take before they learn that research is a long-term investment which pays off only after a decade or so? The work being done today won't show up in hardware until 1960 or later. But if it isn't done today, it may never show up. All the free enterprise in the world can't buy time after a cutback.

This all has a familiar ring. Remember back in 1947 when we were cutting fat out of the military budgets, and research and development was among the first slices.

I'll bet you still feel the effects of that one, don't you?

* * *

What does 10% extra weight mean to a jet fighter? According to a panel of the Society of British Aircraft Constructors, those extra pounds mean:

- **Top speed reduced by 2%.**
- **Range decreased by 11%.**
- **Service ceiling reduced by 16%.**
- **Rate of climb reduced by 16%.**
- **Landing distance increased by 29%.**
- **Landing speed increased by 5%.**

* * *

One interesting security angle of the recent SAE meeting: The program listed the subjects for the confidential sessions. Right in cold type was "Air Force Air-to-Air Falcon, Allen Puckett, Hughes Aircraft." Does the AF still deny that Hughes has a contract for the Falcon? —DAA

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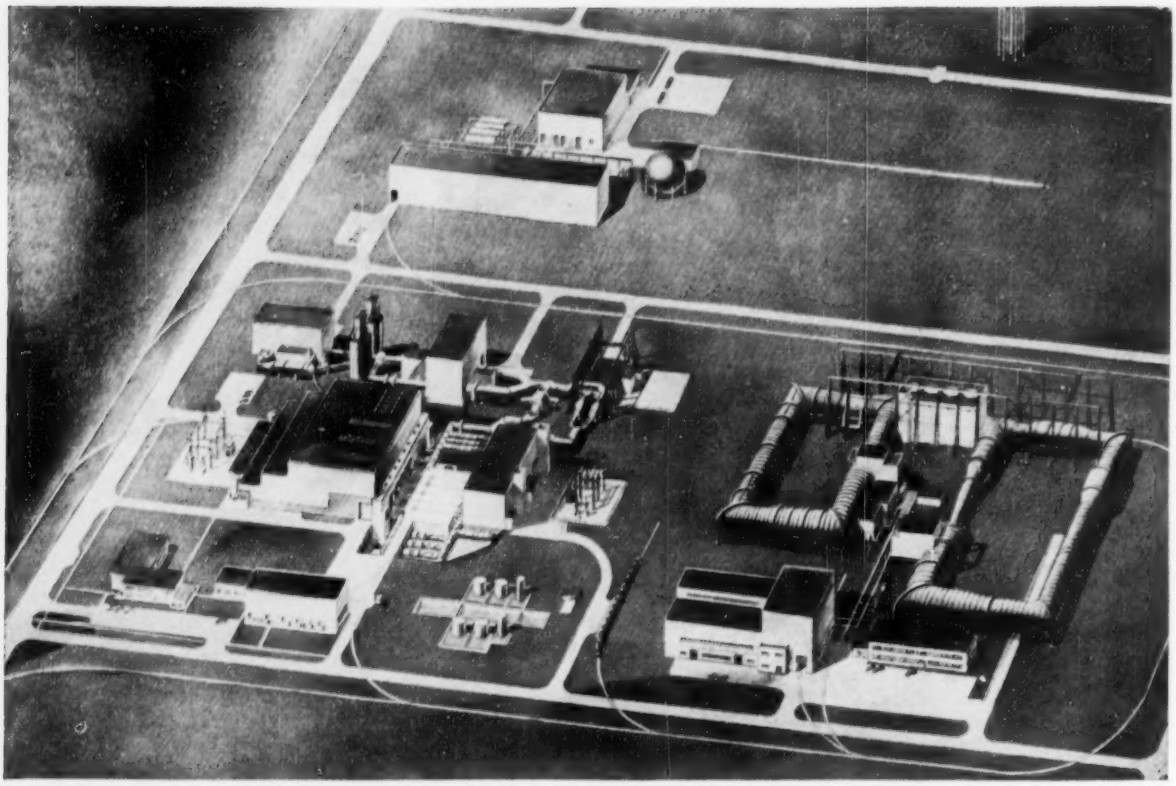


AEDC OVER-ALL PLAN shows location of major facilities being built at new AF research center. Lower left: engine test facility; lower right: propulsion windtunnel; upper center: gas dynamics facility.

Details of Tullahoma Test Center

The Arnold Engineering Development Center's three major installations—engine test facility, propulsion windtunnel, and gas dynamics facility—are rapidly nearing completion at the Tullahoma, Tenn., site.

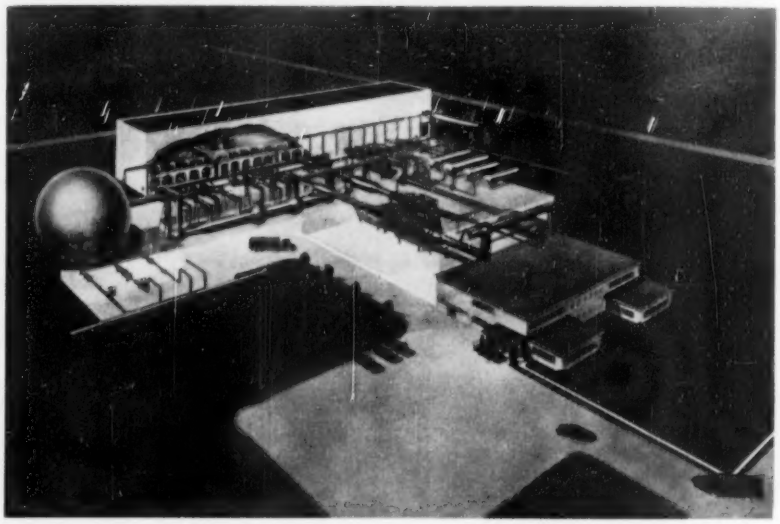
This Air Force activity, one of the development centers of the Air Research and Development Command, will comprise a mighty test and evaluation establishment to unravel problems associated with highspeed aircraft, guided missiles and aircraft engines. Aro, Inc., will operate the facilities under contract with the Air Force.

• **Engine test facility** will embody three test chambers and a test bed. Here, research, development and evaluation will be conducted on turbojets, turboprops and small ramjets under simulated flight conditions and altitudes up to about 80,000 ft.

An additional facility will accommodate the largest ramjets now contemplated, and other test cells are planned for a later date.

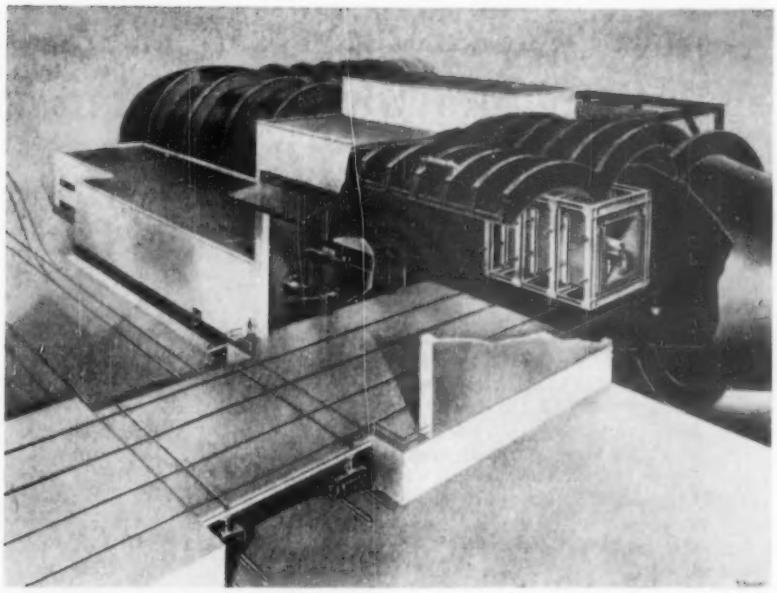
Engines will be shuttled to the test bed chamber on railroad tracks through quick-disconnect doors.

Temperatures as low as —120F will be provided. Basic service installations will include air refrigeration and drying, compressed air supply, exhaust gas cooling and exhausters.

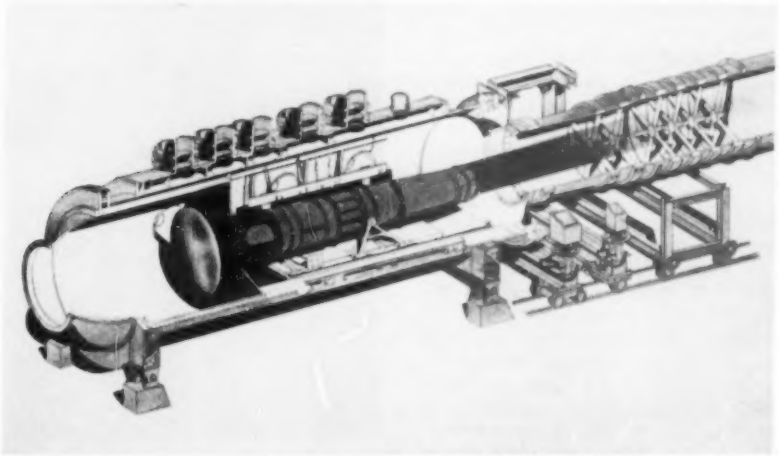


GAS DYNAMICS FACILITY will include highspeed windtunnels that can operate at values over Mach 5.

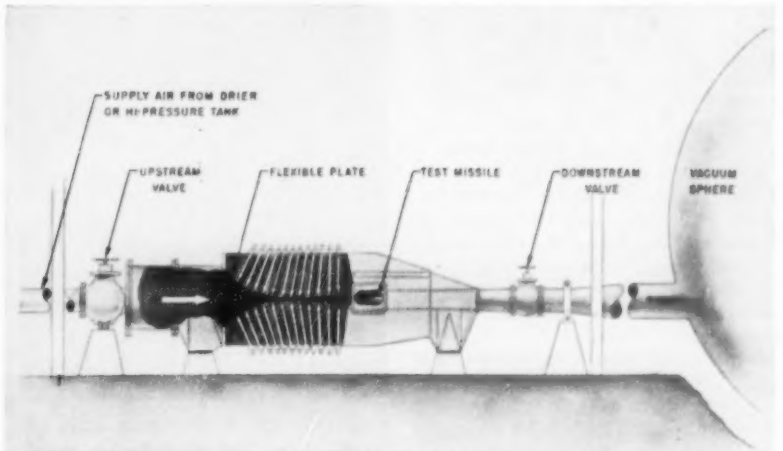
• **Propulsion windtunnel** will include two facilities—a transonic tunnel and a supersonic tunnel, each having 16-ft.-square test sections. Development testing will be on full-scale operating ramjets and turbojets installed in missiles or aircraft. Propellers and aerodynamic



PROPULSION WINDTUNNEL with portable 16-ft.-sq. test section in place in transonic circuit.



ENGINE TEST FACILITY will contain a test bed and three test chambers such as the one shown in sketch.



FLEXIBLE NOZZLE varies opening of 12-in.-square high-Mach tunnel in gas facility. This tunnel started operation in February.

test models also willl be accommodated.

Test section supersonic velocities will be controlled with a huge, flexible-wall nozzle (AVIATION WEEK May 4, p. 36). Tunnel pressure will be capable of variation from 2 atmospheres to that encountered at 100,000 ft. Coolers will provide simulation of standard altitude temperatures.

Test articles will be carried on 40-ft. carts. A battery of these will make it possible to ready units without interference with those being operated in the tunnel.

Westinghouse Electric Corp., which is supplying the five compressors and the 216,000 hp. drive for the propulsion wundtunnel facility, reports that work on the stators is well underway at its Sunnyvale, Calif., plant. The compressors and drive will constitute the world's largest rotating machine, Westinghouse says.

• **Gas dynamics facility** will house a group of supersonic tunnels for development test of models of aircraft, missiles and projectiles designed for very high speeds. Some of the tunnels will operate at values greater than Mach 5.

Two major wundtunnels will have 40-in.-square test areas. Two others will have 12-in.-square test sections.

Prime air mover will be a plant housing six axial and six centrifugal compressors. An auxiliary compressor group will feed a vacuum sphere and high-pressure air storage tube, which augment the main compressor plant. The flexible power system will allow acquisition of test data over widely varying speeds, altitudes and temperatures to predict full-scale flight characteristics.

Test data for all of the AEDC facilities will be processed by digital-type computers.

New Value Set for Viscosity of Water

Kinematic viscosity won't be the same after July 1, says the American Society for Testing Materials.

On that date, the National Bureau of Standards will adopt a new value for the viscosity of water—1.0038 centistokes at 68F. This means that all kinematic viscosities will be reduced by 0.318%, and that all kinematic viscosimeters—but not Saybolt types—will require restandardization or recalibration.

Conversion tables showing kinematic viscosity converted to Saybolt Universal and Furol viscosities will be invalidated, as will basic values for computing viscosity indices. All secondary standard viscosity oils will require restandardization.

New tables for conversion and computation are available from ASTM headquarters, 1916 Race Street, Philadelphia.

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Exclusive Report

Analysis Shows MiG Limitations

A major limitation of the MiG-15 is severe directional snaking at combat speeds, sharply reducing the effectiveness of the plane as a gun platform.

Three other drawbacks: insufficient ammunition capacity, lack of gun-heating for high-altitude combat, and inability to take a beating from gunfire.

These new facts on Russia's first-line fighter have been told exclusively to AVIATION WEEK by a foreign technical observer who studied the fugitive Red fighter flown to Denmark early in March by Polish air force lieutenant Francis Jarecki.

(Difficulty with snaking was first mentioned as a speculation in AVIATION WEEK, Apr. 13, p. 17, because of the trim strip added to the MiG's rudder.)

▶ **Comfortization**—The fugitive MiG's cockpit was heated, and pressurized to a differential of 4.2 psi. from 26,000 ft. altitude on up. Contrary to earlier reports, the pilot was equipped with a parachute of the ribbon type. The ejection seat had an automatic release mechanism for the pilot with a three-second time delay.

According to the observer, the cockpit ". . . is very well equipped with high-quality instruments that carry a clear resemblance of the German Askania instruments."

Airspeed indicator combines both indicated and true airspeed displays. The flap indicator is mechanical; for the landing gear indicator, there is a duplicate system—pins showing through the upper surface of the wing as a visual check, and lights in the cockpit.

A simple gyro type of gunsight—presumably only lead computing—showed a maximum range setting of 2,650 ft. There was no radar ranging equipment tied into the sight.

▶ **Systems**—Armament of the MiG was the now-standard pair of 23-mm. cannon on the port side and single 37-mm. cannon on the starboard. Ammunition carried was 160 rounds total for the lighter cannon and 40 for the heavy.

Both types of cannon had a muzzle velocity of about 2,150 fps. Rate of fire for the smaller guns was 650 rounds per minute, and for the larger, 450 rounds.

There was no heating equipment for the cannon. They were slung in a cradle that could be cranked up and down for quick loading.

A hydraulic system operates flaps, dive brakes and landing gear. There is no handpump for emergency operation. The standby system is pneumatic, with accumulators for landing gear operation built inside the wheel struts.

Brakes are pneumatic, but during re-

PARTING OF WAYS: F-86 Sabre gun camera shows Red pilot ejecting himself from crippled MiG-15 in air combat over Korea.

traction, the wheels are automatically braked by hydraulic action.

▶ **Power Controls**—The only boosted controls are the ailerons, operated hydraulically by a system that uses a special fluid. A fabric seal stops airflow through the wing-aileron gap.

Ailerons and elevators are fitted with electrically operated trim tabs, and all control surfaces carry fixed tabs as well.

The fuel system is simple, says AVIATION WEEK's source, and consists of a main tank behind the pilot and a annular tank around the engine tailcone. A circulating pump is used to cool the fuel and to keep the center of gravity travel within reasonable limits.

Fuselage tank capacity is 370 U.S. gallons, and the wing drop tanks can carry an additional total of 132 gallons.

▶ **Surface Finish**—The MiG shows a mixture of both good and bad hand craftsmanship, and an unusual amount of welded parts. The surface finish is an anodic type, protected with a clear covering coat which gives a very glossy finish.

Maximum Mach number of the MiG-15 is 0.92. Snaking begins at a Mach number of about 0.86.

▶ **Summing Up**—This new information on the MiG shows that it is not the simple, uncluttered design that it has been reported to be.

- First, it contains considerable "luxury" equipment—pressurization, heating, automatic ejection seat release, gyro gunsight.
- Second, it has some duplicate systems—standby for the landing gear hydraulic system is one example.
- Third, it uses hydraulic, electrical and pneumatic power for operation of the various systems instead of concentrating on one type.
- Fourth, instrumentation is complete and of excellent quality.

Table Levels Itself As Metal Is Removed

A new precision vertical mill and tracer-profiler that levels the table automatically for close tolerance machining as metal is removed has been developed by the Hydro Micro-Tel Corp.

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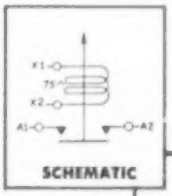

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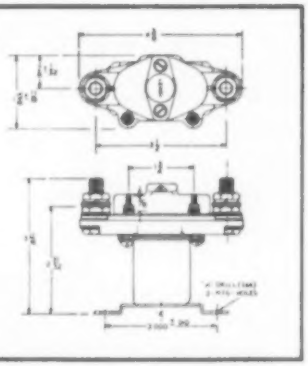

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LETTERS

Guided Boomerangs

"Those F6F Drones" (Letter in AVIATION WEEK *June 1, p. 42) defended Navy's use in Korea of obsolete aircraft as "guided missiles." The letter printed below hits at the mishandling of the F6F story by Navy public relations.—Ed.*

Minutes after the story of Navy "guided missiles" in Korea broke in the press last September, high-ranking Air Force officers in the Far East Command unofficially but loudly labeled the Navy as "frauds" and "schemers."

Throughout the world newspapers and radio heralded the opening—by the U. S. Navy—of the era of push-button warfare. Today this rankles deep in many Air Force men.

It shouldn't. The Navy got headlines but hours later it was caught at the trick of trying to make a story seem bigger than the facts.

From the USS Boxer off the Korean east coast Navy Guided Missile Unit 90 had catapulted six droned Grumman F6F Hellcats carrying TV transmitters and 2,000-lb. bombs. Attack Douglas AD Skyraiders equipped with TV receivers guided the drones into Communist targets.

What the Air Force said was right: This was nothing new. The Army Air Forces crashed pilotless, obsolescent fighters into German targets in World War II.

The Navy was first to test robot planes in Korea. This warranted headlines. But the Navy tried to make the drones appear a brand new weapon just out of research.

I was one of three correspondents the Navy invited aboard the Boxer.

The Navy had advised the three wire services to send men to Task Force 77 for a "big story—too big to miss." They told us there was to be an important strike.

United Press sent me, International News Service assigned another writer and Associated Press sent a photographer (AP and INS were pooling their pictures and stories).

When we landed on the Boxer we were led to a cabin where the ship's security officer very formally gave us a warning:

"We are launching guided missiles from this carrier, but it is top secret. You are here to report only a strike. Remember, if you write about the secret project you will be subject to court martial."

With those words fresh in our minds, we were taken to our cabins. My room-mate was a senior advisor on the guided missile program, a commander on special assignment from Washington.

The AP man found himself in a cabin with another guided missile specialist. Somehow the INS man missed out. But it seemed apparent the Navy was feeding us this "secret" story.

I decided to write it and submit the story to censorship in Tokyo. The AP man had made the same decision, I learned later. INS believed censors would never clear the story and didn't write it.

Finding out about the missiles was easy aboard the Boxer. We were "allowed" to watch each of the launchings but not permitted to take photographs.

The drones had hit a power plant, bridge and tunnel entrance. All were targets in terrain too mountainous for piloted aircraft to operate without risk of hitting a peak.

The TV transmitter in each drone could be picked up by the mother plane and by a receiver on the carrier deck during takeoffs.

The TV screen enabled the controlling officer in the Skyraider to keep the drone on the target until the last second. All this was new to me. It was a nice way to fight a war.

It also gave the Communists a surprise. One drone followed a group of Koreans pumping a railroad hand car into a tunnel.

The controller in the mother plane said he saw the Koreans look up at the drone and head for the tunnel, apparently thinking the Hellcat was going to strafe them. They reached "safety" inside the tunnel just seconds before the drone, and its ton of explosives, followed them into the entrance.

The day I returned to Tokyo I wrote the story and submitted it to junior Navy censors. They panicked when they saw the words "guided missile."

I used "guided missile" to describe the Hellcats for two reasons:

- Technically, they were missiles and they were guided—although far from the sleek Dimension-X types I'd seen pictures of.
- The Navy unit operating them was a "Guided Missile" outfit.

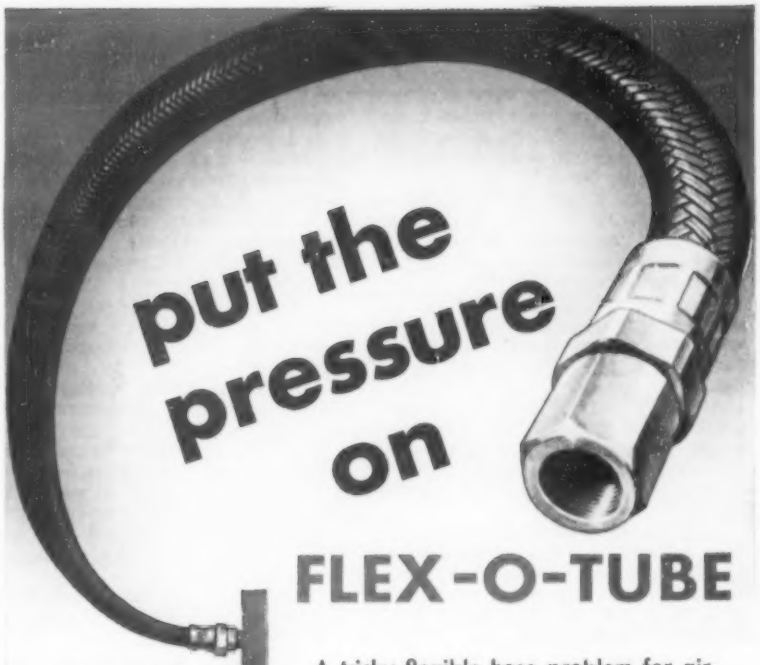
Of course, the story said what type aircraft the "missiles" were.

The censors wouldn't touch my copy, even when I showed them an issue of a popular science magazine that had explained fully how the Navy was droning Hellcats and preparing them for use in Korea.

Censors admitted that since the magazine obviously had had Navy cooperation in preparing the article, the only security information now involved was actual use of the weapon in Korea.

I took my uncleared dispatch to the Navy Public Information Office which agreed to send it along with AP's for possible clearance in Washington. The PIO waited two days before sending the stories, presumably waiting for INS to file.

About 10 days later I got the shock of



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my life. UP's manager for Japan, Rutherford Poats, telephoned me at the Correspondents Club and said, "AP is out with the missile story."

Poats, one of the most level-headed men in the news business, was shaken. "You should see it," he said. "It's fantastic. AP left out that these things are just old Hellcats carrying big bombs."

I picked up a copy of Tokyo Evening News and saw the AP story. It told about "sleek, throbbing missiles" that zipped off the deck so spectacularly it left the crew "tingling with excitement."

There was no mention that these "missiles" were converted, propeller-driven fighters carrying ordinary bombs. This was the first news of the project released to the public.

AP hadn't "left out" anything intentionally (although it put in some florid language). Navy censors in Washington had agreed to release the AP story if AP omitted mention of Hellcats, TV and 2,000-lb. bombs.

After agreeing to release the AP story, the Navy in Washington sent a priority message to Tokyo authorizing release of all "missile" stories with the same deletions. Through some Navy snafu the UP dispatch hadn't arrived in Washington yet.

Nine minutes before the message arrived in Tokyo, UP in Tokyo received a cable from its New York office. The cable said: "AP OUT WITH MISSILE STORY." We let my story go as I had written it.

Editors remade their front pages, radio announcers rewrote their news scripts. Repercussions started.

The Navy called in representatives of all three agencies for a conference in the Pentagon. It accused UP of releasing security information.

A high-ranking Navy officer said this would make it difficult for any reporter to get aboard a Navy ship or even to get information in the Pentagon.

"Is this a threat?" asked the UP representative, Herbert Foster. He was assured it was not and that the officer didn't really mean what he said.

The Navy dropped the matter that day, when it became apparent it was in no position to take action without further embarrassing itself.

Editorial writers were blasting the Navy for the way it had used censorship to get better play in the papers.

Time Magazine wrote: "In the battle for bigger headlines, press officers for the military . . . sometimes try to make a news story seem bigger than it actually is. Last week, through the snafus of its own censorship setup, the U. S. Navy got caught at the trick."

Time called the maneuver a "guided boomerang" and credited UP with scaling the "stunt down to size."

Unfortunately, the episode brought discredit on the entire Navy, including the honest, capable men working on the missile program itself.

Knowing well what Air Force reaction would be after the story was out, we called up Brig. Gen. William P. Nuckols, Far East Air Force spokesman at the time, for his comments on the Navy guided missile program in Korea.

For the record, Nuckols said nothing. But he talked 20 minutes. Air Force pilots, crewmen and other personnel were just as heated in their response.

Was it just a Navy stunt? I don't think so.

No excuse can be made for the officer in Washington who tried to deceive the public by releasing the story without the facts to put it in focus. That was bad public relations. It hurt the earnest young men on the Boxer who were on the Hellcat operation.

They were finding things out. They learned robot planes could operate against an enemy from a carrier without interfering with normal combat operations on the carrier.

They were learning things that practice in the States doesn't teach.

They also eliminated six targets and gave the Communists something to think about. But until something really new in push-button warfare is introduced in Korea, I'm sure of hearing remarks like those made recently by some Sabre pilots in Seoul:

"The Navy's guided missiles! Why, we were using those things in Germany. . . ."

ROBERT GIBSON
United Press Correspondent
Seoul, Korea

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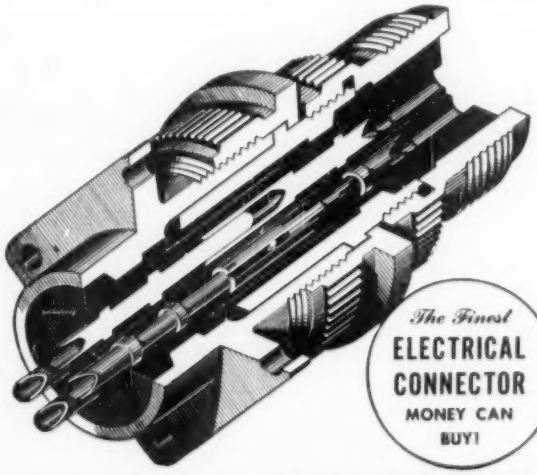

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Why Designers Are Using More Plastics

- **Engineer reports easy maintenance, low costs.**
- **Resistance to corrosion and fatigue also is cited.**

By Irving Stone

Continuing progress in the use of reinforced plastics was underscored recently when a group of about 500 engineering representatives of airframe builders, material suppliers, molders and researchers met at the Grumman plant, Bethpage, N. Y., for a session of the Institute of the Aeronautical Sciences' New York section.

Already these plastics are being used widely in up-to-the-minute military designs. They have been put to work in a whole range of aircraft, from the big Boeing B-52 to Navy's advanced fighter, the Convair Sea Dart. Test installations already have been made in jet engine compressor sections. The prospect is that tomorrow's superspeed designs will incorporate an increasing amount of the material.

▶ **Why Plastics?**—In the short life of the reinforced plastics industry, many advantages have been found in use of these materials for high-performance aircraft and missiles.

William E. Braham, chief engineer of Zenith Plastics Co., Gardena, Calif., outlines some of these factors in a paper prepared for the IAS session.

Braham stresses ease of maintenance in the field and resistance to corrosive effects of air at high temperatures, sea water, high humidities, aircraft fuels, hydraulic fluids and lubricating oils.

He also says tapered thicknesses required in most modern aircraft wings and tail surfaces can be produced from reinforced plastics with semi-skilled labor and inexpensive equipment and that molds and tools for forming the aircraft structures are less costly than equivalent tooling to form metals.

▶ **Some Applications**—Braham reveals that radomes have been designed for as high as 25-psi. surface pressures, to withstand loads imposed by 2-in. hailstones at aircraft cruising speed, and resist gun-blast pressures of 20-mm. cannon.

Electronic requirements in several large bombardment-type aircraft have necessitated the use of reinforced plactics as part of the primary structure. In some cases, almost entire sections of the plane are electronically isolated from the rest of the structure by using large reinforced plastic parts as insulators.

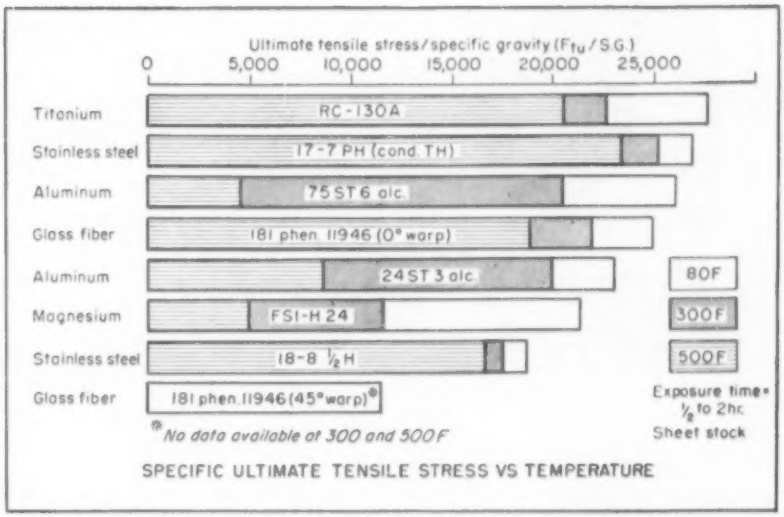
The bending, shear, torsion and local loads are carried from the isolated metal structure—which serves as an antenna—by the reinforced plastic structure to the rest of the plane.

Braham estimates that Zenith has made 100,000 fin- and wingtips and almost 75,000 radomes for military aircraft. These parts and others are found in such aircraft as Convair's XF2Y-1 Sea Dart and B-36; Lockheed's P2V Neptune, WV-2 Super Connie, F-94 and F-80; McDonnell's F2H Banshee and XF3H Demon; Boeing's B-52 Stratofortress and B-47 Stratojet; and Republic's F-84.

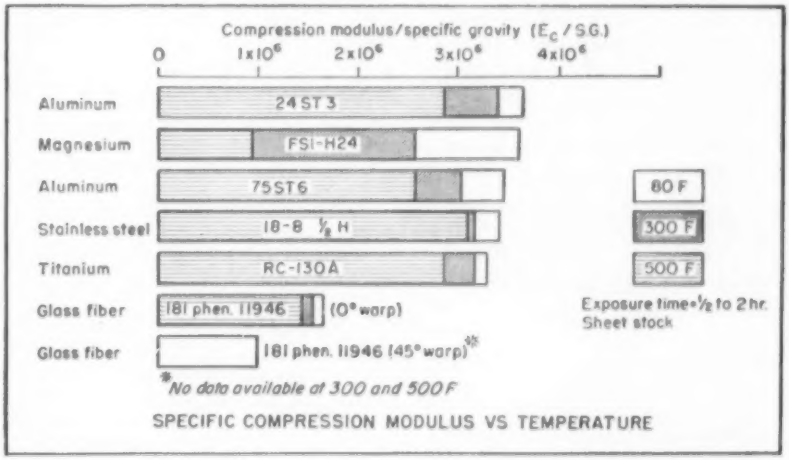
One fuselage component now being produced in reinforced plastics at Zenith measures 17 ft. long, about 6 ft. high and 3 ft. wide. No stringers, bulkheads or rings are used—it is a monocoque, honeycomb-core structure. It has withstood almost 300% of ultimate design load in static test, Braham claims.

▶ **Plastics vs. Metals**—Laboratory test data offered by Braham compare specific physical properties of sheet metals and reinforced plastic material for various temperatures. (The specific physical property is, for example, the ultimate tensile stress divided by the specific gravity.) Some of these test results are shown in the accompanying charts.

Above 300F, the most promising



SPECIFIC ULTIMATE TENSILE STRESS VS TEMPERATURE



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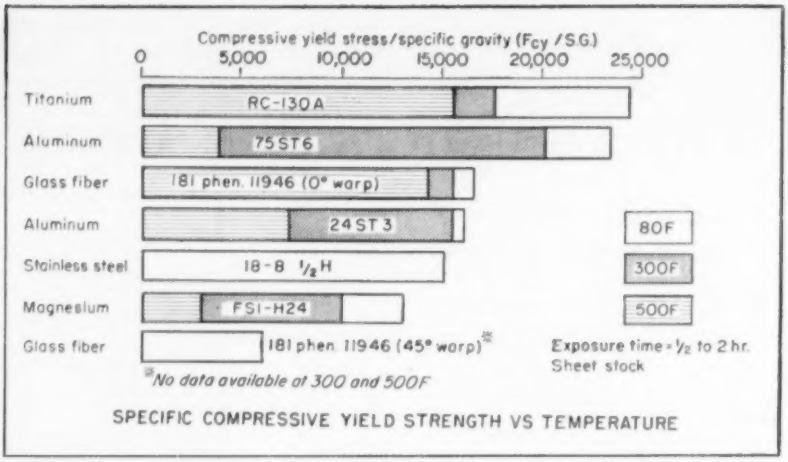
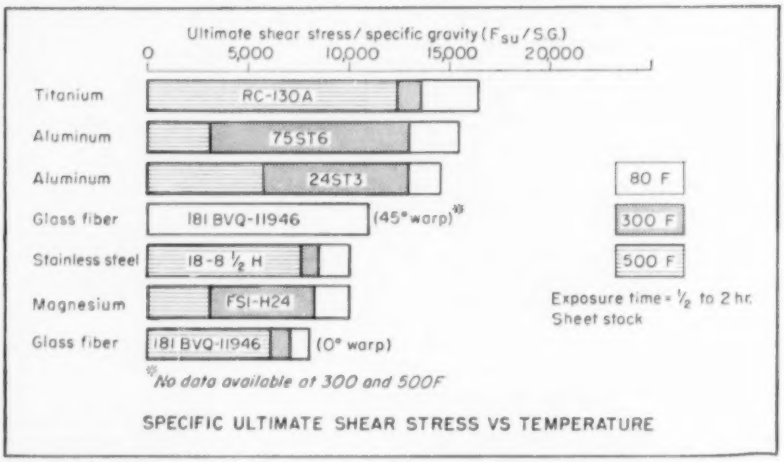


SPECIFIC COMPRESSIVE YIELD STRENGTH VS TEMPERATURE



SPECIFIC ULTIMATE SHEAR STRESS VS TEMPERATURE

materials appear to be titanium, stainless steel and glass fiber-Bakelite phenolic laminate, Braham says.

In sheets of equal weight, glass fiber-phenolic laminates compare favorably with metal alloy sheet on a stiffness basis, he claims, although the shear strength and the modulus of the glass fiber-phenolic laminates are poorer than metals. But because of the inherent ease of constructing glass fiber sandwich components, these characteristics can be overcome, Braham claims.

The data shown for the glass fiber-Bakelite phenolic laminates are for 181 cloth. Greater values are available for combinations of 181 cloth and unidirectional glass fiber cloth (143), he says.

▶ **Design Data Available**—There now is sufficient data for engineers to design wings, fuselages and tail surfaces of presently available plastic materials. Furthermore, these aircraft structures can be manufactured at much less cost than for contemporary metal counterparts, Braham told AVIATION WEEK.

Zenith has made studies indicating that some structures can be built for as little as 20% of the cost of the equivalent in metal, he says. These studies were made on highly loaded parts and the plastic structure was designed to conform with the most efficient techniques in use today. Major components such as wing panels and fuselage sections were involved. These design studies indicate the feasibility of plastic parts for planes and missiles now in building, Braham says.

▶ **Economies Seen**—In a typical design, he claims, the plastic makeup will require only about 10 to 15% of the component parts of the equivalent metal assembly. This has a substantial reflection in the engineering task. Only about 20% of the engineering man-hours required for a metal airframe are needed to design a reinforced plastic structure to meet the same specifications and requirements, provided the engineer has adequate knowledge of plastic materials, Braham says.

Other economies also result in space, machinery, and production and administration force requirements.

Braham doesn't see the "plane of the future" as being made up entirely of reinforced plastics, but rather as a combination of plastics and metals. The reinforcement for the plastic might encompass a variety of fibrous material as well as a metal reinforcing medium.

► **Engine Research**—Apparently there is a strong possibility that reinforced-plastic blades will be used in turbojet engine compressors (AVIATION WEEK Mar. 2, p. 104), the IAS session learned.

Dr. Elmer Warnken of Cincinnati Testing Laboratory revealed in his paper on high-temperature phenolics that the art of producing these blades has matured to the point that model test engines are being assembled at this time.

The application of CTL-91-LD (a Cincinnati-developed temperature-resistant phenolic resin) to this engine part has resulted in moldings that appear to be more reliable in centrifugal loading and in fatigue resistance than the steel blades they are expected to replace, Warnken claims.

Another prime example of plastic design is the use of the phenolic material in the jet engine compressor stator case.

In each of these applications, resistance to approximately 500F for prolonged periods of time is necessary. Tests indicate the complete reliability of the parts for these applications, Warnken says.

He also reveals that the fabrication of structural parts for use at temperatures around 1,200F for periods of several minutes, and at temperatures in excess of 3,000F for 60-80 sec., has also been successful.

► **Blade Applications**—From a reliable source, AVIATION WEEK learned that successful runs have been made in one jet engine using, in the first six stages of the compressor, Fiberglas-reinforced-plastic blades employing Cincinnati's phenolic binder. This use has taken the material into the 450-500F range.

Standard aerodynamic design has been employed for the blade configurations but, in some cases, modified roots have been used, it is reported.

The blades have been made in matched steel dies, with the glass cloth-resin material being laid in the form of ribbons and extruded through the pinch-off portion of the dies. Blade molding requires less than five minutes and finishing takes only about two minutes more. It is said that under high-volume production, cost for a plastic blade in this engine would be about 35 to 50 cents.

► **Lighter Blades**—It is estimated that on this particular jet engine, about 300 lb. of weight could be saved by use of reinforced-plastic for some of the compressor blading material. In metal, each blade weighs an average of about ¾ lb. whereas the plastic blade would be about ¼ that weight, AVIATION WEEK learned. It is reported that perhaps half of this engine's compressor blades could be replaced with plastic units.

This would seem to add up to less starting load for the engine, less centrifugal load and less gyroscopic load (in maneuvers). Also, since the blades would be lighter, wheel construction also could be lighter. Another feature would be the greatly decreased hazard in the event a blade were thrown.

► **Other Engines**—Experimental plastic prototype blades are also being built for three or four stages in the compressors of two more-powerful jets. In one of these engines, the weight of the metal blade is said to average about one pound, so that the plastic counterpart, with its ¼ weight, would introduce considerable savings if found successful here.

For another high-thrust jet, test model stator cases are now being readied in reinforced plastic, it has been reported.

► **Turboprops Too**—The turboprop engine, too, is the subject of study for incorporation of plastic blades in the compressor. One of these engines will be investigated with plastic units in the first few compressor stages and again in a number of the middle stages where the heat runs relatively high, it is said.

Aside from the savings in critical metals, plastics technicians stress the rapid production possible for the reinforced plastic blade. Also, critical forg-

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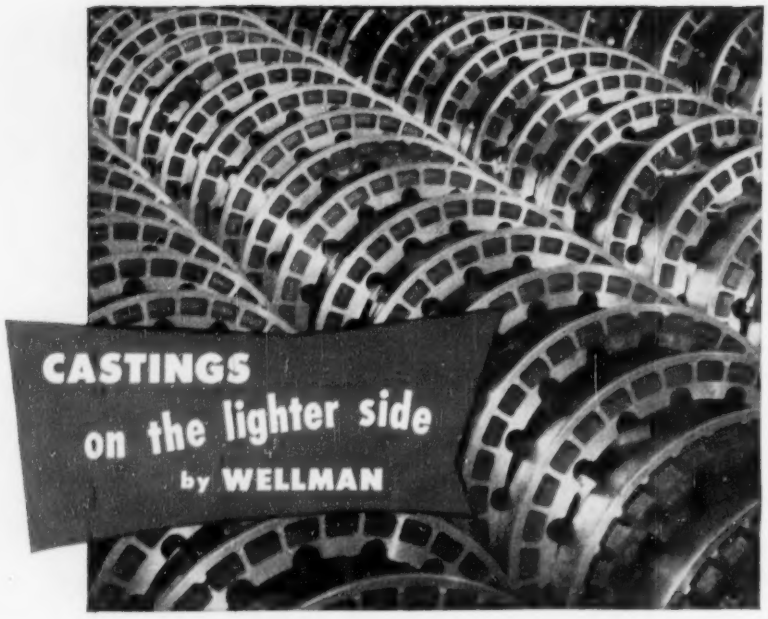

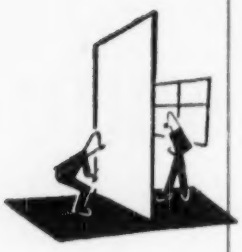

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ing and grinding tools are released for other work.

▶ **Radome Progress**—Problems encountered in radome engineering were outlined by Samuel S. Oleesky, of Reinforced Plastic Consultants & Engineers, Gardena, Calif. Protection against gun-blast effects is one of these.

To resist these effects, a glass-nylon sandwich was brought out at the Naval Air Development Center, Johnsville, Pa. This solution was very satisfactory for small radomes, but the thin cross-section was not adequate for the larger installations.

Later, Zenith Plastics developed a foam known as Zenofoam G, to act as a shock absorber in radome sandwiches. This material is used in thousands of radomes in gunfire systems, Oleesky says.

Hail resistance has brought headaches, too. Research by Oleesky and an associate has resulted in development of a core material and a skin impregnation system that absorbs the energy of a hailstone, instead of transmitting it through the plastic sandwich. A 1-sq. ft. panel of this construction has repeatedly withstood the impact of a 2-in. steel ball dropped 26 ft., Oleesky claims.

Most radomes with icing control are made by the "lost wax" process, which provides segregated channels in the radome core into which hot air may be forced from a heat source. With proper design of mazes and outlets, a constant stream of warm air is circulated under the radome skin to keep it ice-free. This system was developed at Douglas Aircraft, and licensed to Zenith for fabrication.

To combat rain erosion, a special coating of synthetic rubber and other ingredients has been developed. This coating will greatly increase the life-expectancy of radomes without appreciably affecting efficiency, Oleesky says.

▶ **Parts Displayed**—Typical aircraft parts fabricated of reinforced plastics were displayed at the meeting. Russell Reinforced Plastics Corp., Lindenhurst, N. Y., showed high-temperature ducting, duct adapters, wire ducting (conduits), door shield, radio access door and fairing, trailing edge, fintip and junction box housing.

Zenith parts included wingtip rib, brace and stiffener units for the B-52, I-beam, channel and fairings.

New Planes to Dutch

(McGraw-Hill World News)

The Hague—Holland has ordered a large number of Lockheed P2V Neptune patrol bombers to replace its World War II-vintage Lockheed Harpoons. The Neptunes will join two squadrons of Grumman Avengers also to come from the U. S.

Once completed, the mammoth stretcher will work in conjunction with large extrusion presses in Alcoa's "Big Press" Program . . . which includes the 15,000-ton model, shown above.

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- **Pratt, Read & Co., Inc.**, Ivoryton, Conn., helicopter parts, $289,035, 50%.
- **B. G. Instrument Corp.**, Corona, N. Y., aircraft parts, $8,583, 70%.
- **B. N. Aircraft Co., Inc.**, Farmingdale, N. Y., aircraft parts, $24,759, 55%.
- **Liberty Products Corp.**, Farmingdale, N. Y., aircraft parts, $224,185, 40%.
- **Western Air Lines, Inc.**, Los Angeles, airport facilities, $250,000, 60%.
- **Swedlow Plastics Co.**, Los Angeles, aircraft parts, $2,360, 70%.
- **Cooper Precision Products**, Los Angeles, aircraft parts, $112,114, 70%.
- **Associated Pacific**, Venice, Calif., airplane parts, $29,000, 50%.
- **Pan American World Airways, Inc.**, Seattle, airport facilities, $700,000, 60%.
- **Industrial Tool & Machine Co., Inc.**, Smithfield, R. I., aircraft parts, $8,500, 70%.
- **Barridon Oil Burner Corp.**, Hartford, Conn., aircraft parts, $11,384, 70%.
- **Turbo Industries, Inc.**, Glastonbury, Conn., aircraft parts, $6,041, 70%.
- **Aviation Engineering Corp.**, Woodside, N. Y., aircraft parts, $21,834, 60%.
- **Kellett Aircraft Corp.**, Camden, N. J., aircraft parts, $41,449, 70%.
- **Bendix Aviation Corp.**, Sidney, N. Y., aircraft components, $15,301, 55%; Teterboro, N. J., aircraft instruments and accessories, $94,393, 60%; South Montrose, Pa., aircraft parts, $139,670, 65%.
- **Zarkin Machine Co., Inc.**, Long Island City, N. Y., aircraft parts, $4,100, 70%; $19,000, 70%.
- **Anchor Slide Fastener Corp.**, Westbury, L. I., N. Y., aircraft parts, $110,820, 70%.
- **Fairchild Engine & Airplane Corp.**, Farmingdale, L.I., N. Y., aircraft parts, $5,678, 65%; Hagerstown, Md., aircraft parts, $20,000, 40%.
- **Bell Aircraft Corp.**, Wheatfield, N. Y., aircraft & aircraft parts, $21,990, 65%.
- **Vahl Engineering Co.**, Brooklyn, aircraft parts, $23,504, 70%.
- **Glenn L. Martin Co.**, Middle River, Baltimore, aircraft & parts, $83,209, 50%.
- **Western Electric Co., Inc.**, Greensboro, N. C., aircraft parts, $41,672, 65%.
- **Slanker Brothers**, Dayton, machining of aircraft and ordnance parts, $67,850, 45%.
- **Wee-Oln Co.**, Ferndale, Mich., aircraft parts, $25,000, 45%.
- **Penn-Michigan Mfg. Corp.**, Detroit, aircraft parts, $5,550, 70%.
- **United Aircraft Products, Inc.**, Dayton, aircraft parts, $51,173, 70%.
- **Hydraulic Fittings Corp.**, Marysville, Mich., aircraft parts, $50,596, 60%.
- **Dawco Mfg. Co., Inc.**, Wichita, aircraft parts, $18,526, 70%.
- **Western Control Corp.**, Wichita, aircraft parts, $70,000, 40%.
- **Solar Aircraft Co.**, Des Moines, aircraft components, $1,700,000, 40%; San Diego, Calif., aircraft parts, $61,650, 40%.
- **Luscombe Airplane Corp.**, Garland, Tex., aircraft and parts, $109,442, 60%.
- **Stanley Aviation Corp.**, Denver, aircraft parts, $440,000, 45%.
- **Mitchell Camera Corp.**, Glendale, Calif., aircraft parts, $12,500, 70%.
- **J. A. Bonzung Co.**, Los Angeles, aircraft parts, $63,099, 70%.
- **Phaostron Co.**, South Pasadena, Calif., aircraft parts, $36,725, 45%.
- **Vendorlator Mfg. Co.**, Fresno, Calif., aircraft parts, $144,338, 65%.
- **Douglas Aircraft Co., Inc.**, Santa Monica,

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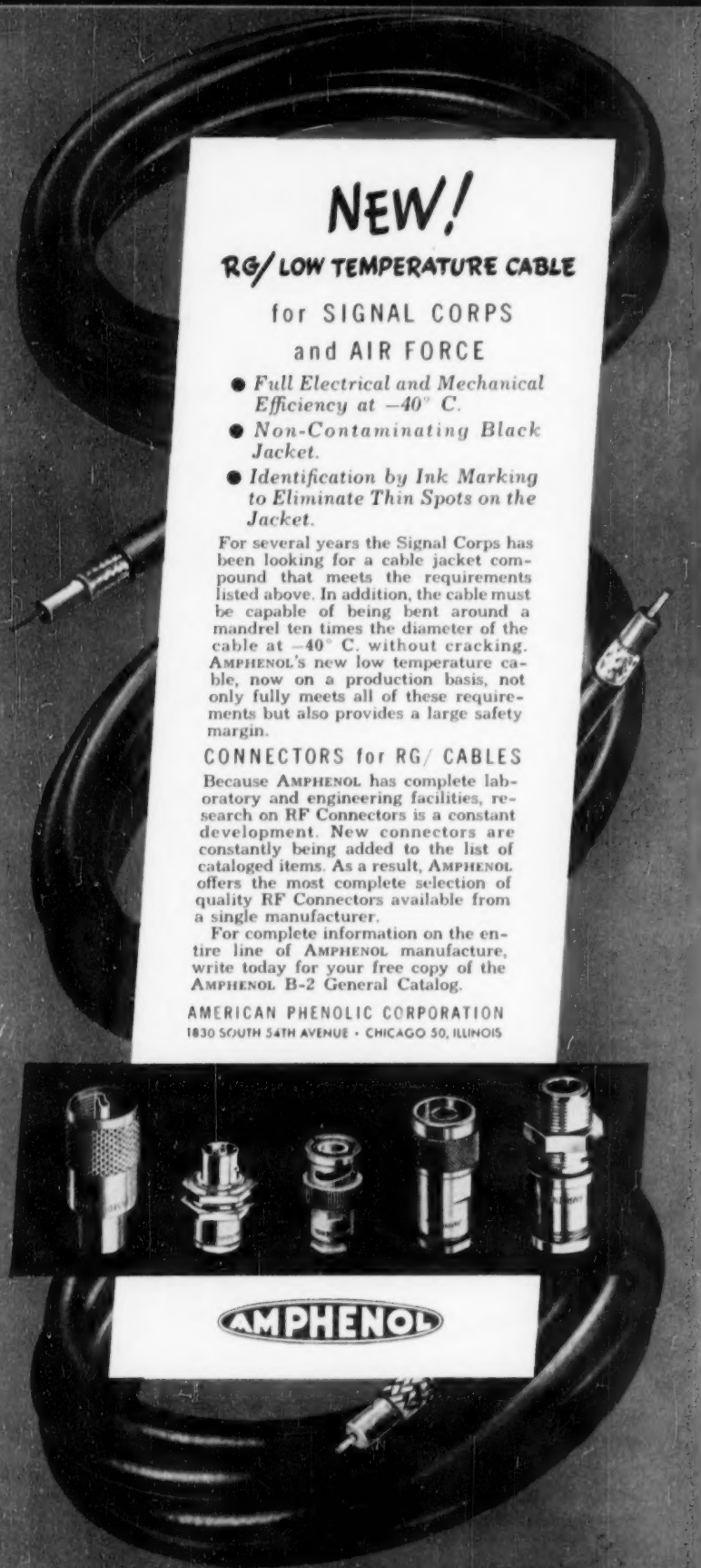

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- **A. O. Smith Corp.**, Los Angeles, aircraft parts, $173,268, 65%.
- **Hartwell Aviation Supply Co.**, Los Angeles, aircraft parts, $33,304, 70%.
- **Lockheed Aircraft Corp.**, Burbank, Calif., aircraft parts, $84,713, 60%; aircraft and aircraft parts, $54,352, 60%.
- **Southworth Machine Co.**, Portland, Me., aircraft parts, $58,829, 70%.
- **Kearfott Mfg. Corp.**, Newark, N. J., aircraft parts, $22,831, 65%.
- **Hicksville Machine Works**, Hicksville, N. Y., aircraft parts, $11,663, 70%.
- **Bendix Aviation Corp.**, Teterboro, N. J., aircraft parts, $59,552, 65%.
- **Eton Machine Co., Inc.**, Farmingdale, N. Y., machining of aircraft parts, $4,355, 70%.
- **Esso Standard Oil Co.**, Baltimore, aviation alkylate, $260,000, 100%.
- **Goodyear Aircraft Corp.**, Akron, airships & military aircraft parts, $232,217, 65%.
- **H & A Tool & Die Co.**, Detroit, aircraft parts, $9,034, 70%.
- **Columbia Mold & Die Co.**, Middlefield, Ohio, machining ordnance & aircraft parts, $50,599, 60%.
- **Foote Brothers Gear & Machine Corp.**, Chicago, aircraft parts, $14,000, 65%.
- **Flexonics Corp.**, Maywood, Ill., aircraft equipment, $127,500, 40%.

USAF Contracts

Following is a list of recent USAF contracts announced by Air Materiel Command.

Airpath Instrument Co., Lambert Field, St. Louis, compass, pilot's standby, 6,695 ea., 659 ea., $201,873.

Bendix Products Div., Bendix Aviation Corp., South Bend, wheel assys., 500 ea., brake assys., 500 ea., $665,474; wheel assys., 955 ea., 619 ea., $124,284.

Boeing Airplane Co., Wichita, modification of aircraft, $1,000,000.

Bolsey Corp. of America, 118 E. 25th St., New York, gun camera, 4,061 ea., 28 ea., 213 ea., $2,983,458.

Dye Machine & Supply, R. E., 207-9 W. Williams St., Breckenridge, Tex., rack, 4,566 ea., release, bomb shackle, 4,675 ea., 890 ea., $147,383.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, indicator, 7,497 ea., 462 ea., 2,555 ea., $507,994; accelerometer, 4,510 ea., 4,796 ea., $923,794; generator, 1,800 ea., 1,080 ea., $1,103,574.

Electric Storage Battery Co., Philadelphia, aircraft storage battery, 4,597 ea., $210,864.

Family Films, Inc., 8840 W. Olympic Blvd., Beverly Hill, Calif., projection print, 53 ea., $49,952.

General Tire & Rubber Co., 1708 Englewood Ave., Akron, wheel assy., 514 ea., spare parts and data, 159 ea., $53,117.

Goodrich Co., B. F., Akron, boot de-icer, 285 ea., 23 ea., $54,908; pin, contractors, 9 ea., cap, contractors, 5 ea., bolt, contractors, 1,464 ea., $243,411.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron, wheel assy., 160 ea., brake assy., 221 ea., spare parts & data, $332,488.

Johnson Fare Box Co., 4619 N. Ravenswood Ave., Chicago, charger, 3,144 ea., $90,148.

Joy Mfg. Co., 338 S. Broadway, New Philadelphia, Ohio, fan, aviation, axial-flow model, 146 ea., engineering data, 1 set, $28,303.

Kindred Aviation Corp., 3519 Pacific Ave., Burbank, transmitter, 45 ea., components, $57,133.

Kollsman Instrument Corp., 80-08 45th Ave., Elmhurst, N. Y., indicator, 372 ea., $99,503.

Neptune Electronics Co., 433 Broadway, New York, interphone control, 1,600 ea., 672 ea., spare parts, $106,272.

Plane, Missile Reliability Needs Differ

Vibration problems are entirely different, meeting hears; new temperature rating system is suggested.

By Philip Klass

Pasadena, Calif.—Techniques used to mount electronic components — and some of the components themselves— that have proved reliable in aircraft equipment won't stand up under the rigors of vibration encountered in guided missiles, an engineer from Cal Tech's Jet Propulsion Lab told the recent Electronic Components Symposium here.

Another symposium speaker urged the electronic component industry to scrap its present method of rating components in terms of maximum allowable ambient air temperature and switch to a rating expressed in terms of maximum allowable component surface temperature.

▶ **Thirty Papers.** Included in the 30 technical papers given before the 1,500 engineers who attended the three-day ECS were reports on:

- **Transistor troubles,** their causes and cures.
- **New solid dielectric** for improved capacitors.
- **New gas dielectric** for high-temperature transformers and waveguides.
- **Protective coatings** for etched wire circuits.

▶ **Rugged Missile Environment**—Engineers designing avionic equipment for missile use were urged to beef up the rigidity and reduce the length of phenolic and melamine boards that are used to mount electronic components. Otherwise the mounting boards will resonate and amplify the G-loads applied to individual components.

This advice was contained in a joint paper by F. A. Paul and C. R. Gates of Cal Tech's Jet Propulsion Lab and was based on tests run there. (Paul has since left JPL to head the newly formed electronic reliability section at Northrop Aircraft Co.)

Paul cited an equipment tested at JPL under 10G vibration where the components were actually taking a 100G beating because of mounting board resonance.

For missile avionic equipment, Paul recommends:

- **More rigid chassis,** designed in I-beam or T-beam shapes and using stand-off terminals.
- **Shorter lead lengths** of resistors, capacitors and similar components, to increase their resonant frequencies.
- **Securely anchored components** (to the chassis), with cantilevered components such as canned electrolytics and sealed relays fastened at both ends.
- **More care** in the selection of vacuum tube position on a chassis to minimize the effects of vibration.
- **Hard mounting,** i.e. no shock or vibration mounts. Paul believes that resonances resulting from shock mounts and the sharp bottoming of shock-mounted equipment are more hazardous than possible ill effects from hard mounting.

▶ **Little Correlation**—Paul reported that there appears to be little correlation between the reliability of such components as vacuum tubes and relays under low-intensity long-duration vibration (aircraft) and their reliability under high-intensity short-duration conditions (missiles).

For example, JPL tests under high-intensity vibration indicated that premium tubes were far superior to older JAN types. However, an earlier Signal Corps test under low-intensity long-duration conditions indicated that premium tubes had poorer survival records than their commercial counterparts. Paul cautioned that more data is needed to determine whether correlation is always poor.

▶ **Better Relays Needed**—Few relays can stand up under high-intensity vibration even for short intervals, Paul reported. He cited these types of failure: chattering contacts, sticking armatures, mechanical breakage, and increasing contact resistance.

Balanced-armature type relays are particularly susceptible to failure, Paul said, adding that JPL had found only one relay of this type that could withstand the 10-20G missile environment vibration.

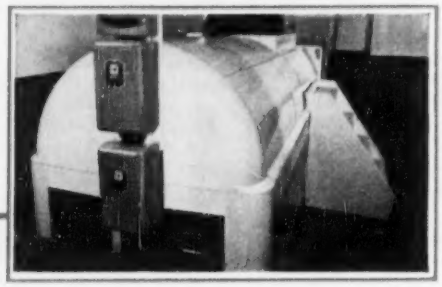
▶ **New Temperature Ratings?**—"Present ambient temperature type ratings for components are not satisfactory; there are too many thermal loopholes," according to J. P. Welsh of Cornell Aeronautical Lab. He based this statement on extensive CAL studies of avionic heat dissipation problems under Navy BuShips contract.

Component failure or deterioration due to heat occurs because internal temperatures have exceeded the safe limits for the materials used in its construction. Welsh says that CAL's investigation indicates that component surface temperature is a much more significant indication of internal component temperature than is the temperature of the ambient air surrounding the component.

Ambient temperature type ratings may be suitable for an outdoor substation transformer or an industrial motor, but they are not adequate for miniature and subminiature electronic

What They Said About Reliability

- "I cannot urge . . . too strongly the necessity for every manufacturer of electronic components for the guided missile program to install statistical quality control . . . (this) is more important than any other (factor) in the whole missile reliability program."—**Maj. Gen. Leslie E. Simon, chief of Research and Development Div., U. S. Army Ordnance.**
- "Reliability of electronics equipment . . . embraces more than component parts, but the reliability of component parts is an essential ingredient. . ." **Dr. James W. McRae, president of the Institute of Radio Engineers, vice-president of Bell Telephone Labs.**
- "There . . . (is) a new reliability consciousness in the military as evidenced by some 200-300 research and development projects specifically directed toward this end; a new branch of technology which might be called 'reliability engineering'; and recognition . . . of the futility of trying to procure integrity and reliability, particularly in the development phase, through present government competitive purchase practices."—**D. A. Quarles, president of the American Institute of Electrical Engineers, vice-president of Western Electric, chairman of the committee on electronics, Research and Development Board.**
- "Reliability of components used in missiles must be several orders of magnitude higher than those used in aircraft. We must abandon the old idea of investigating only 'epidemic' type failures. A single component failure may indicate a serious weakness and it must be traced to its basic cause."—**Dr. R. Lusser, U.S. Naval Air Missile Test Center, Pt. Mugu, Calif.**



Front View of C-11B Jet Flight Trainer as it appears installed in its mobile training room. Steps lead to pilot's station under the canopy. Trailer training room is 14 x 20 with wall extended.

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Link Electronic Jet Trainers operate with dependable certainty. They duplicate *exactly* the take-off, landing and "in air" conditions of today's most advanced aircraft—speed, direction, rate of climb, effect of fuel consumption on trim, flight position, deviation and a host of others.

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equipments operating at high power densities, Welsh believes. In these cramped equipments, a component may pick up more heat by direct radiation than it does from the surrounding air. Also, convection currents are set up which result in large differences in ambient temperature at different locations within an equipment case.

Another shortcoming of ambient temperature rating, Welsh said, is the considerable inconsistency in the techniques used by different avionic manufacturers in measuring ambient temperature within their equipments. For example, during CAL's field survey it found some instances where the leads of thermocouples used to measure ambient temperature were unknowingly conducting heat out of the equipment, giving an erroneous reading.

Welsh recommended that component manufacturers switch to a new system and rate their components in terms of maximum allowable surface temperature. He indicated that some manufacturers were considering making the change.

Surface temperature of components can be measured in several ways, Welsh indicated. The new temperature-sensitive paints that change color with temperature have a reported accuracy of ± 5C, he said.

Colored waxes, which melt at a predetermined temperature, are also easy to use and have an accuracy of ± 1%, Welsh said.

For more accurate measurement, Welsh recommended closely calibrated thermocouples.

▶ **Recipe for Good Transistors**—"The recipe for good transistors is the same as for good martinis; keep them dry," Dr. W. H. Sittner of Bell Telephone Labs reported.

This conclusion comes from extensive investigations into the causes of transistor failures. Dr. Sittner identified them as:

- **"Sudden death,"** found in point-contact transistors, is the sudden change in alpha (amplification), particularly when the collector is operated at low voltage.
- **"Slow death,"** found both in point-contact and junction transistors, is a gradual shift in transistor characteristics, particularly collector impedance.
- **"Sleeping sickness,"** found in both types of transistors, but a more serious problem in junction transistors, is evidenced by the appearance of a sizeable potential at the emitter when a bias voltage is applied to the collector.

Sudden death and slow death can be cured completely by hermetically sealing the transistor, Sittner said. He said that Bell Labs have operated hermetically sealed point-contact transistors for almost 6,000 hours without a

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Years of experience in fabricating stainless steel, aluminum alloys and other allied materials have earned Lavelle a reputation as a truly unique and reliable subcontractor.

Lavelle

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significant change in their characteristics. Sittner cautioned that hermetic sealing would reduce but not cure all junction transistor sleeping sickness. However, he implied that Bell Labs is working on other fixes to wipe out this transistor disease.

Hermetic seals can take the form of glass encapsulation or a metal case with a glass seal, Sittner said. He also suggested the possibility of grouping non-sealed transistors in a single container and using a dessicator to keep out moisture.

▶ **Dielectric Amplifiers for Servos**—Dielectric amplifiers, employing voltage-sensitive dielectrics, should find application in the field of non-linear servomechanisms, J. L. Jenkins of Radiation, Inc., told the ECS. One bothersome limitation to their widespread use is that dielectric amplifiers are extremely sensitive to changes in humidity and temperature, Jenkins said.

Jenkins described a two-stage audio-frequency dielectric amplifier with a power gain of 18 db. per stage and said his company also has applied non-linear dielectrics to multivibrator and electrically adjustable filter circuits.

▶ **New Dielectrics**—Lanosterol, a new high dielectric solid isolated from wool fat, when used as an impregating compound for paper capacitors, extends their operating temperature range, cuts size, and improves performance, according to a paper prepared by Dr. Girard T. Kohman of Bell Labs. The new compound is said to be chemically inert and have a dielectric constant of 10 in the solid form.

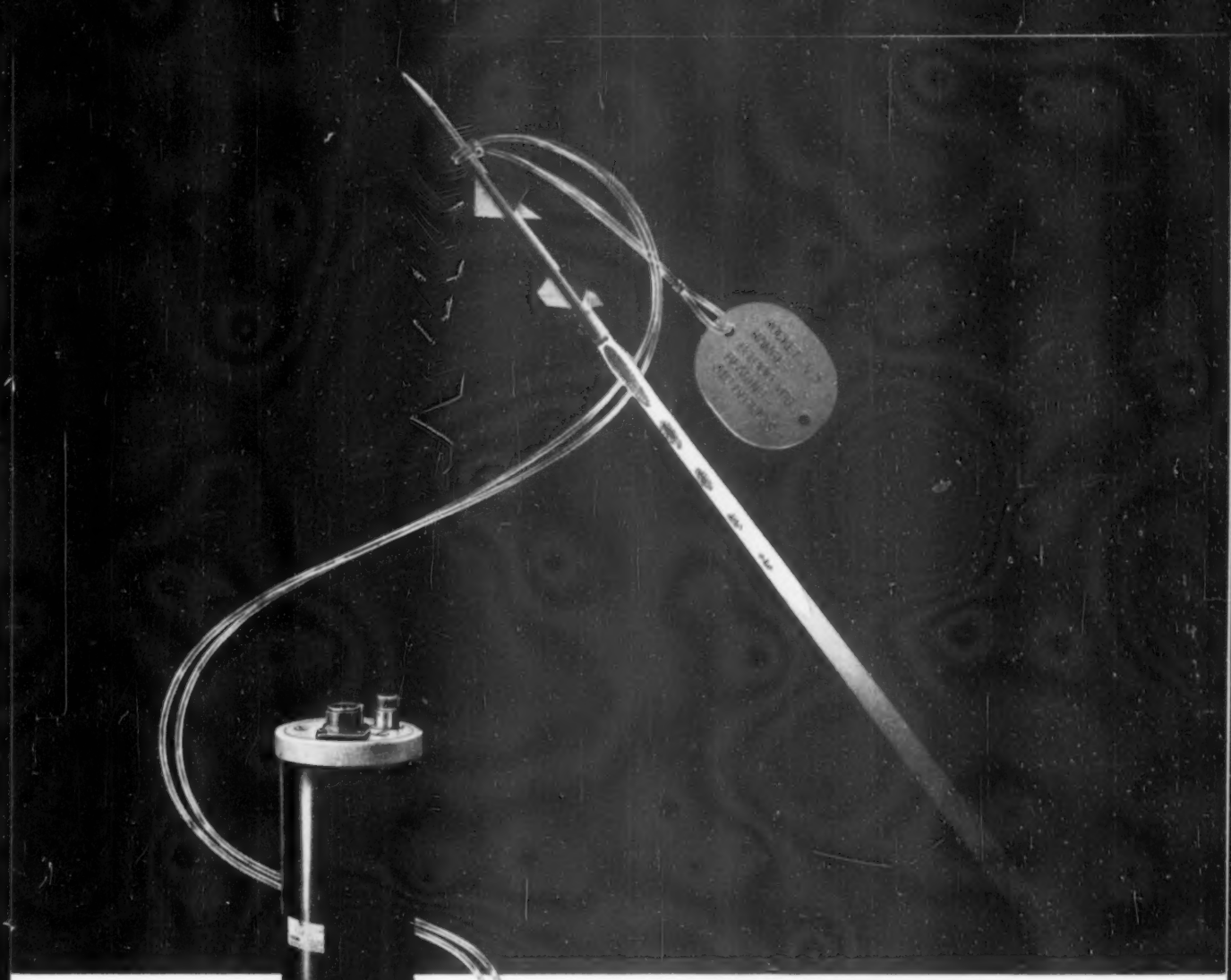
Designers of transformers that must operate at temperatures of 300C may turn to use of gases for dielectrics, Dr. Kohman predicted.

Such gases as sulfur hexafluoride and the fluorocarbons under 50-psi. pressure show a dielectric strength nearly equal to the oils now used in transformer, Kohman's paper reported. It predicted their use in radar waveguides, cables, and transformers.

▶ **Protective Coatings** — Unmodified epoxy resin has better resistance to humidity than polyesters, L. J. Martin of Hughes Aircraft Co. reported, and urged its use for protective coatings on etched circuit wiring. (Morris Weinberg of HAC was co-author of paper.

Martin said that a 20-35-mil coating thickness offered optimum humidity protection but prevented easy removal of components for maintenance. Reducing coating thickness to 2-5 mils makes it possible to remove components but naturally reduces humidity resistance, Martin pointed out.

▶ **High-Temperature Rectifiers** — Selenium rectifiers capable of operating at 130C are now available and even higher temperature units are in the offing, ac-



DOG TAG ON A ROCKET...

Rockets are elusive weapons which are frequently lost in the radar scope. These fast flying missiles present a minimum target which is hard to track.

But now a Bendix-Pacific Radar Beacon is installed in the missile to provide a reinforced echo that is easily observed—like an identifying dog tag. These Beacons, which weigh only 5½ pounds incorporate both a receiver and a transmitter, providing a powerful signal which is retransmitted in 2 microseconds. In addition to use in missiles, the Bendix-Pacific Beacons simplify air traffic control problems, reduce the time of locating targets for airborne radar checkout and, in effect, increase the size of target drones to simulate larger aircraft.

The importance of Bendix-Pacific electronic developments in airborne radar, radio control, telemetering and missile guidance have brought about rapid expansion of this company's engineering and manufacturing facilities. Three plants and a highly specialized group of electronic engineers are available to develop and produce advanced applications to meet your requirements. Your inquiry is invited.

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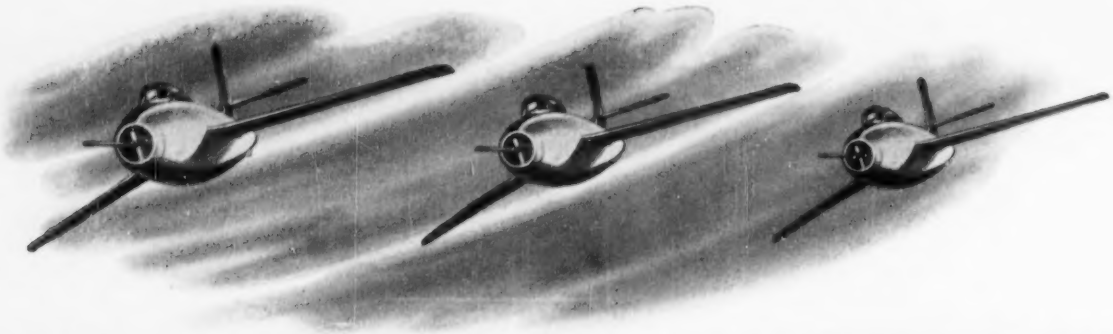
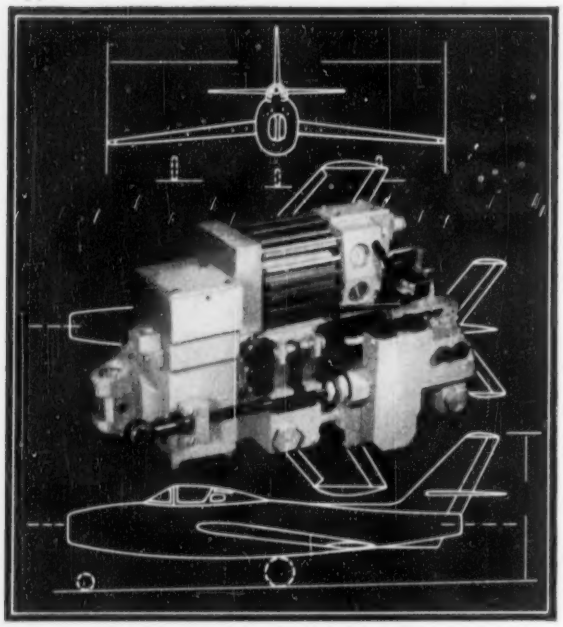


AEROPRODUCTS ACTUATORS CONTROL "FLYABLE TAIL"

Self-locking features aid Republic's new F84F



Typical Aeroproducts Actuator

The broad adaptability of Aeroproducts actuators has helped to solve problems encountered in the design of the "flyable tail" of the new Republic F84F jet fighter. The application of these actuators permits instantaneous adjustment of a variable surface to any position within its design range. The self-locking feature of Aeroproducts actuators secures the adjustment until it is changed by the pilot.

Any combination of systems—hydraulic, pneumatic, electric or manual—can serve as the primary power source for Aeroproducts actuators. They can be synchronized readily in tandem or in series to provide coordinated control of related movements.

Announced uses of Aeroproducts actuators include those for the control of the "flyable tail" of the Republic F84F, the horizontal stabilizer on another high-speed jet fighter and the afterburner nozzle in a jet engine. Additional applications include control of wing flaps, dive brakes, bomb bay or cargo doors, gun turrets, variable wing sweep and incidence, wing fold and canopy slides.

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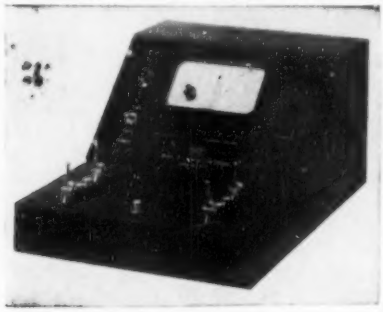
cording to a paper prepared by G. B. Farnsworth of General Electric.

Operating at 100C, these selenium rectifiers have a 2,500-hour life expectancy with only a 10% drop in output voltage during this period.



Unskilled Can Use Electronic Checker

Unskilled operators can quickly check resistors, capacitors and inductors against a preset standard value and read the deviation directly in percentage using a new device developed by Southwestern Industrial Electronics Co. The new Model E-1 comparison bridge can also be used to compare the values of two components which must be matched within a given tolerance.

The device is capable of checking components in the following ranges: resistors of one ohm to five meghoms; capacitors of 500 μμfd to 2,000 μfd; inductors of 3 mh. to 10,000 henrys. Accuracy is 0.1% according to maker, 2831 Post Oak Road, Houston 19, Tex.

Two-Axis Gyroscope Floats in Liquid

A two-axis displacement-type gyroscope is floated in liquid to enable it to withstand vibration and shock encountered in guided missile applications. The gyro was developed by American Gyro Co. of Santa Monica, Calif., for several missile manufacturers. AGS says the device is the first two-axis floated displacement gyro to be made available to the missile industry.

The AGC gyro weighs approximately

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three pounds. It has 360 deg. freedom of movement about one axis and ± 85 deg. movement about the other. The new gyro has a small auxiliary motor which can be remotely controlled to cage and align the gyro with its case. No gravity erection system is provided in the current model.

AGC says the gyro can be made available using either d.c. or a.c. motors and with either d.c. or a.c. pick-offs. Random drift rate is quoted at approximately ¼ deg. per minute with d.c. pick-offs; slightly less drift with a.c. pick-offs.

American Gyro Co., 1509 Colorado Ave., Santa Monica, Calif.

FILTER CENTER

► **IRE Components Group Formed**—A new Professional Group on Electronic Component Parts has recently been formed within the Institute of Radio Engineers. Floyd A. Paul, formerly with the Cal Tech Jet Propulsion Lab and now employed by Northrop Aircraft Co., is chairman of the new group. A. W. Rogers of the Signal Corps Engineering Labs is vice chairman.

► **New Gilfillan Radar Trainer**—Gilfillan Bros. of Los Angeles is building 50 new sub-miniaturized versions of a radar trainer for use with the AN/CPN-4 military GCA. The new trainer will be capable of producing two simulated aircraft on GCA radar scopes and putting these "aircraft" through a variety of maneuvers for training GCA operators.

► **USAF to Speed UR**—Air Force is trying to speed the flow of information to manufacturers to tell them how their equipment is performing in the field or in combat, Major General Donald L. Putt of the ARDC told the IRE recently. For example, a copy of an Unsatisfactory Report (UR) is forwarded to a manufacturer as soon as it is received by the Air Materiel Command instead of waiting for AMC study and analysis, General Putt said.

► **CVA to Telemeter Flight Data**—Chance Vought Aircraft shortly will take delivery on its new Bendix-Pacific Division telemetering ground station equipment for use in aircraft flight tests. The equipment, similar to that now used by Boeing and A. V. Roe in Canada, will permit ground crews to check results of flight tests while in progress, thereby expediting tests.

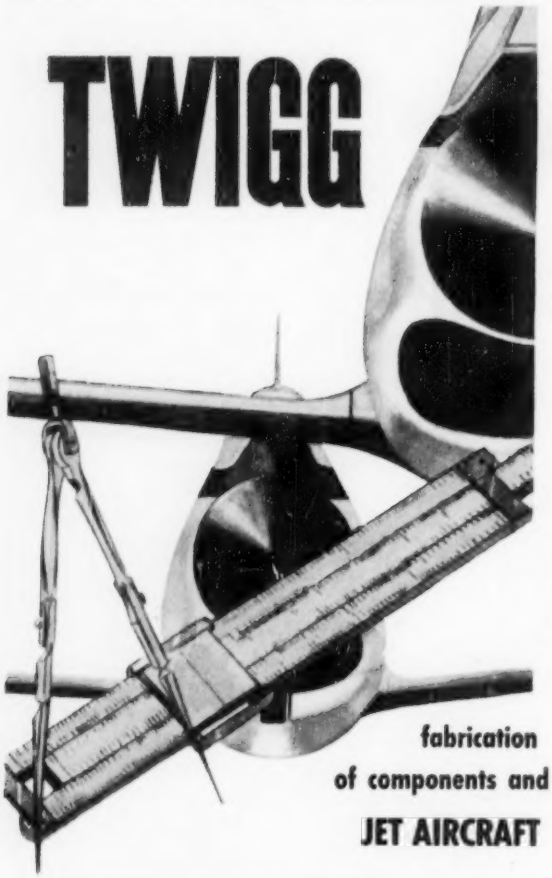
► **Northrop Forms Reliability Group**—Northrop Aircraft Co. has recently set up a group whose sole task is to find ways and means of improving the reliability of avionic equipment used in Northrop's missile programs. Hughes Aircraft Co. and North American Aviation reportedly have similar groups.

► **Hydro-Aire Buys Analog Computer**—Growing use of analog computers outside the airframe and servo mechanisms industries is indicated by recent purchase of an analog computer by Hydro-Aire, Inc. of Burbank, Calif. The computer will be used to simulate control system and turbine performance in the turbo-drives which Hydro-Aire designs and builds. The device, called EASE (Electronic Analog Simulating Equipment) is manufactured by Berkeley Scientific Co. of Richmond, Calif. Hydro-Aire believes itself to be one of the first aircraft accessory manufacturers to buy an analog computer.

► **Avionic Literature**—New technical bulletins describing equipment of interest in the avionics field include:

• **UHF test equipment** for measuring impedance, voltage, power, VSWR, attenuation, and reflection coefficients, is described in a six-page bulletin prepared by General Radio Co., 275 Mass. Ave., Cambridge 39, Mass.

• **Electronic facilities** and activities of the Garrett Corp. are described in booklet 4-0-1. The 16-page bulletin is available from AiResearch Manuf. Co., Los Angeles, Calif. —PK



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Those two pods hanging from the wing of this B-36 each house two jets. They're a big help in getting the mammoth bomber airborne.

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VICKERS' Universal Turbojet Engine Simulator will look like this in production.

Jet Fuel Controls Tested Cheaper

By George L. Christian

A jet engine simulator, capable of duplicating with high accuracy jet engine inflight operating conditions at a very small fraction of present costs, has been developed for Navy's BuAer by Vickers, Inc. (AVIATION WEEK May 11, p. 84).

The Universal Turbojet Engine Simulator, as it is called, is the first of its kind to be produced in this country, according to the manufacturer.

Consisting of an infinitely variable-speed hydraulic drive and an electronic analog computer, it is to be used for developing, testing and calibrating fuel control components for gas turbine engines. Two years of intensive research in cooperation with the Navy were required for its perfection.

▶ **Operation**—Here is how it works. The jet engine manufacturer supplies an equilibrium fuel flow plot for the engine to be simulated. This plot is transcribed to a gridded piece of cellophane which is placed over an oscilloscope in the computer. A technician then adjusts a series of controls which make the scope's basic pip trace coincide with the fuel flow plot. This regulates the simulator to duplicate exactly the fuel flow characteristics of the engine in question—for all practical purposes, the simulator is the engine.

Operation of the fuel control which is being tested can then be checked by observing oscilloscope tracings.

▶ **In the Future**—Vickers sees many potential customers for its simulator. Among them are jet engine manufacturers, jet engine fuel control makers, jet engine test centers (military now, but to be joined by civilian establishments as commercial jets get into the air), overhaul bases, etc.

The Navy has been using the simulators for over a year. Vickers says it has a $500,000 development contract from BuAer. It also has a production contract which it will start filling soon. Vickers adds that it will provide continuous service to the Navy by doing basic simulations on new engines and fuel controls as they come into being. USAF is interested in the device.

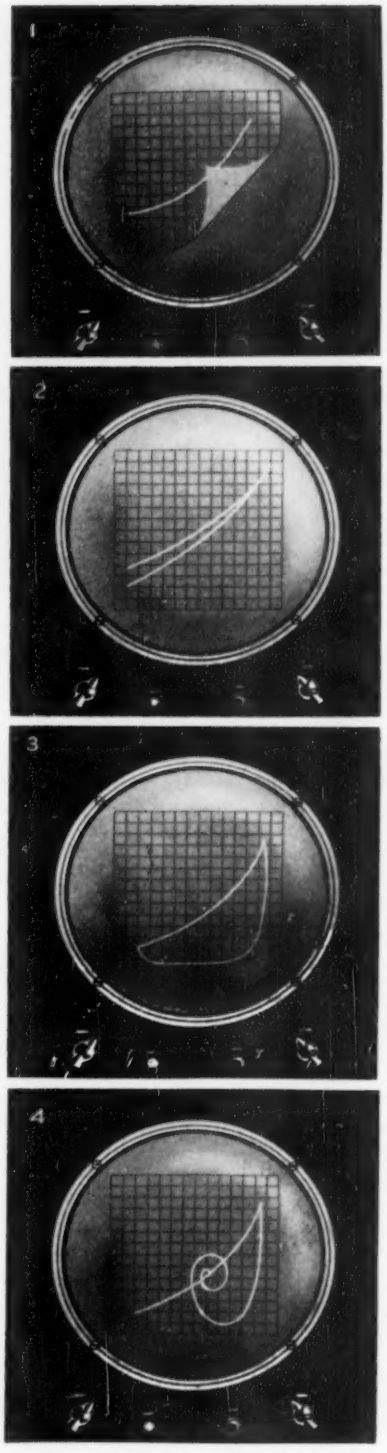
The engine simulator will be commercially available in a year or a year and a half, Vickers estimates.

▶ **Many Savings**—Vickers cites these advantages for the simulator:

• **Money saver.** The $5,000 an hour which Vickers spokesmen estimate to be the cost of checking out and calibrating fuel controls in a test cell can be reduced to about $100 by using the simulator.

• **Time saver.** Many months of development work on fuel systems for experimental engines may be eliminated since the device will make it possible for jet engine manufacturers to test completely a newly designed fuel system before installing it on a new jet engine.

• **Versatile.** The simulator is easily adapted to test any type of current jet engine or any that may be built within the next five years, Vickers says. The simulator can test fuel systems for turbojet engines with fixed or variable-area tails, turbojet engines with after-



SETTING UP the simulator: Manufacturer's curve is placed over scope (1). Technician adjusts controls until oscilloscope trace coincides with manufacturer's curve (2). Simulator will now duplicate engine's performance. Other figures show scope pattern for normal military output to idle deceleration (3), and military to mid-range deceleration (4), showing slight instability.

SAFER SHIPS TO FLY—BECAUSE OF

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AMP terminals give the extra margin, the extra factor of assurance that makes ships wired with AMP terminals safer ships to fly. That's why 85-90% of all aircraft manufacturers specify AMP terminals!

it's the extra margin of safety that counts!

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Bonded Insulation: Here is insulation that stays put because it's BONDED—does not rely on crimping action alone to maintain protection. **Insulation Support:** AMP PRE-INSULATED DIAMOND GRIP® TERMINALS have double support action over the critical junction area of wire and terminal barrel. Both inner copper sleeve and bonded insulation sleeve help prevent sharp wire bends and frayed insulation. 3 special tool adjustments insure positive grip over wide range of insulation diameters. **Controlled Installation Tooling:** AMP *CERTI-CRIMP*® HAND TOOLS are designed to make every terminal application never too tight and always tight enough. This exacting, pre-determined crimp is the secret of AMP'S outstanding performance. Jaw dies (gauged to ± .003) close with exactness every time, and the same control and precision is obtainable whenever you use AMP hand tools or AMP automatic machines! **Dot and Color Coding:** AMP *PRE-INSULATED DIAMOND GRIP*® TERMINALS AND TOOLS are color matched to insure proper combination. AMP dot coding "brands" each application so you know that the right team has been used together. **Speed of Application:** AMP AUTOMATIC WIRE TERMINATORS will help keep your wire preparation up to schedule. 1200 to 1800 PRE-INSULATED® type terminations per hour are not unusual with these machines!

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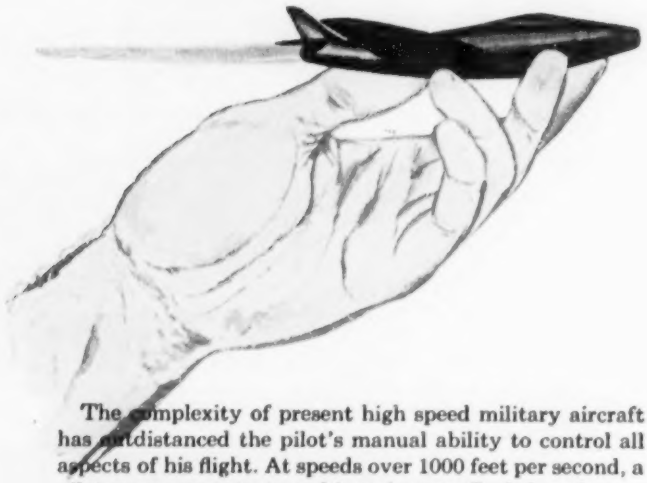

The complexity of present high speed military aircraft has outdistanced the pilot's manual ability to control all aspects of his flight. At speeds over 1000 feet per second, a pilot must concentrate on his trajectory. Such functions as fuel transfer, tank-pressure regulation, afterburner eyelid control, cabin pressurization and fuel-filter de-icing must be accomplished automatically. In these functions, AEROTEC Float Switches, Valves and Pressure Switches have contributed greatly to the solution of flight problems at trans-sonic speeds—truly a pilot's unseen helping hand!

AEROTEC Automatic Controls have passed extensive qualification tests *simulating actual flight conditions* in accordance with Spec MIL-E-5272. They are installed on such high speed aircraft as the Boeing B47B and B52, Grumman F9F-6, Northrop F89D and Lockheed F94C.

Constant research by AEROTEC Engineers into problems of hermetic sealing, high-pressure actuation, corrosion and high- and low-temperature conditions has maintained AEROTEC'S reputation as progressive designers and manufacturers of the highest quality products.

Let our qualified engineering staff help solve your automatic control problems. One of our specialists is near, ready to serve you. Call or write today.

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Designers and Manufacturers of Automatic Controls—*Valves:* Regulating, Relief and Check types—*Pressure Switches:* Gage, Altitude, Differential and Absolute Types—*Float Switches:* Top, bottom or side mounted—Single, Dual or Tandem.

burner and with afterburner plus a variable-area tail, and turboprop engines.

In addition, Vickers points to these features:

- **High horsepower** output for weight and size.
- **Accurate drive speed control.**
- **Stable response to control signals.**
- **Infinitely variable speed control.**
- **Usable speed range** from 0-100% of rated speed.

Current drives put out 50 hp.; later models will go as high as 100 hp. Potter flowmeters are used because of their accuracy of ½%.

Vickers tried a variety of drives for powering the test stand before settling on the hydraulic method. The hydraulic drives gives a rate of response no other type of drive could match, the company says. Rapid rate of response is particularly important because some of today's engines can accelerate from idle to full military rpm. in five to six seconds.

▶ **Analog Computer**—The electronic analog computer derives its information from actual military engine performance data representing the dynamic characteristics of a specific type and model of jet engine.

Reeves computers are used on research simulator models, but production simulators will be equipped with Philbrick computers, largely because of price considerations, Vickers says.

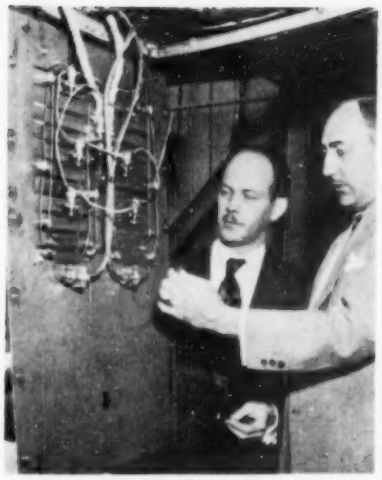
The simulator contains all equipment required to operate the fuel control under closely regulated calibrating conditions, as they would occur in actual flight.

▶ **Better Tool**—Vickers has this to say about previous methods of testing jet engine fuel controls:

"The testing of a turbojet engine fuel control has, in the past, involved little more than steady-state operation of the control at a number of discrete speeds within its operating range. This static type of test is at best a poor measure of whether the fuel control will operate satisfactorily with a particular engine.

Vickers spokesmen point out that a given fuel control system, when coupled to an engine, may induce unstable operation even though the bench test results are outwardly satisfactory. This apparent paradox can arise from an improper time constant in the fuel regulating system, or any of the several dynamic effects in the control that are not revealed by bench tests.

Another limitation of most conventional fuel control test stands, Vickers engineers claim, is their inability to maintain the speed of the control in the governing range of operation. "This is a natural limitation originating in the negative power slope characteristics of the governing curves, but one which can be overcome with a properly designed test stand," they say.



DETECTOR CABLE is built around low-impedance thermistor developed by Edison engineers. Lyle E. Tarbell (right), head of CAA's Reciprocating Engine Section, and Joseph A. Garratt, assistant chief engineer at Edison, examine B-36 installation.

Edison Develops New Fire Detector

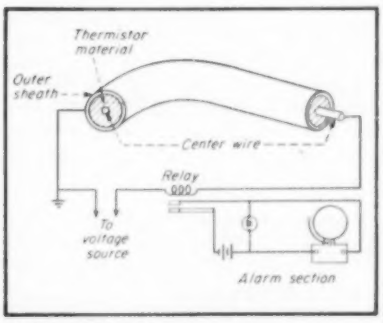
A new aircraft fire detector is under development at the labs of Thomas A. Edison, Inc., West Orange, N. J.

The device incorporates a thermistor, or semi-conductor, developed by Edison engineers. The thermistor is mounted concentrically between an outer metal conductor tube and a center wire.

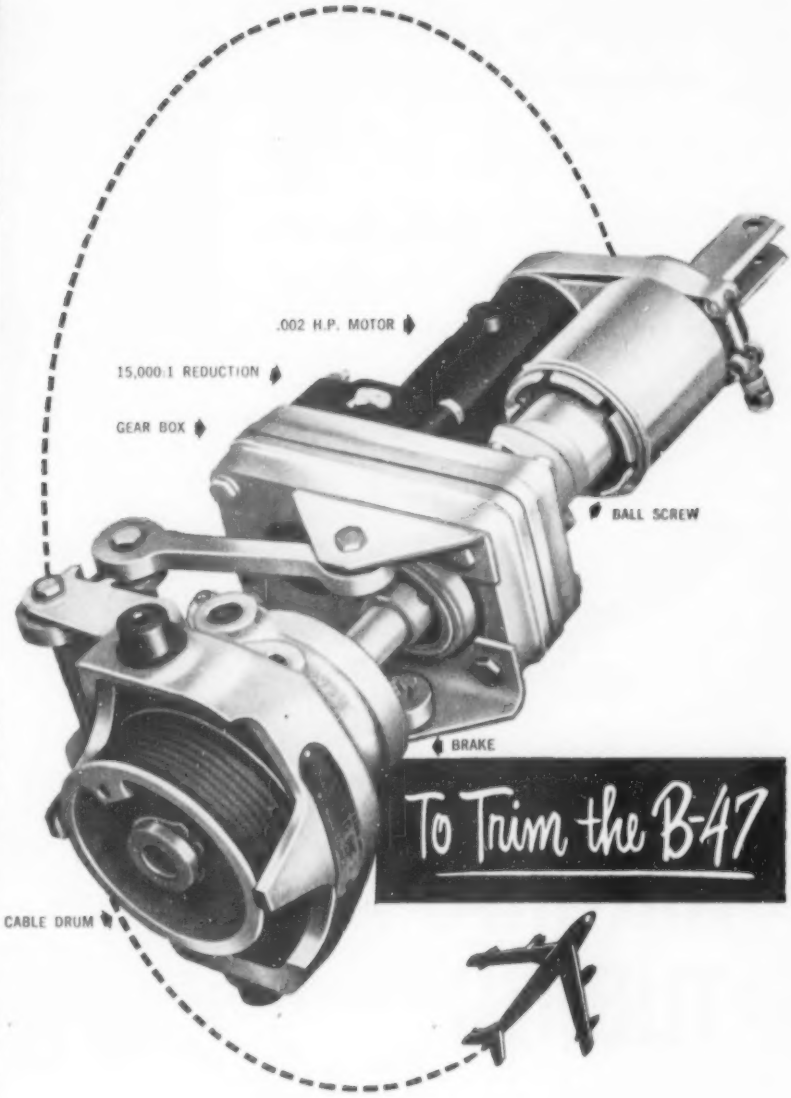
The thermistor offers a near-infinite resistance at normal temperatures, restricting the current flow to the order of micro-micro-amperes. But at a predetermined temperature, the thermistor becomes conductive, allowing sufficient current to flow between the outer and inner conductors to operate the warning system.

Edison's detector is a low-impedance system and requires no electronic tubes to amplify the warning current. A relay does the trick.

▶ **Test Installations**—The new detector is currently being tested on several military aircraft, both piston- and jet-



HOW TYPE B fire detector works.



...or to raise a garage door

Vard-Boeing designed, Vard manufactured, this aileron trim tab actuator compensates for load distribution of the Air Force's famous B-47. All components are made by Vard.

This same principle of Vard's exclusive Ball Screwjack, which transmits rotary motion to linear motion with up to 90 per cent efficiency, may open doors or perform other duties. It's very likely applicable to a problem you're facing. Write Vard today for details.

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powered. CAA's Technical Development and Evaluation Center, Indianapolis, has run tests of the system in the nacelle of a B-36 R4360 engine. A Northwest Airlines Stratocruiser is flying with the detector installed in one of its R4360s. Other commercial test installations are contemplated.

Called the Type B or cable-type fire detector, the device is now moving from the laboratory to the production shops. However, Edison engineers emphasize, it is still in the evaluation phase and not yet ready for widespread use.

▶ **Detector Features**—In addition to the Type B's simplicity, a result of the elimination of electronic tubes, the maker points to these features:

• **Light.** Cable weighs only .01 lb./ft. Control unit weighs 1½ lb. and measures 2x3¼x4¾ in.

• **Positive.** The cable is a closed loop circuit. It can break anywhere along its length and both halves remain operative.

• **Heat resistant.** Careful selection of the materials used to manufacture outer tube and semi-conductor make the cable extremely resistant to high temperatures—over 2,000F, says Edison.

• **Rugged.** The solid-packed coaxial cable is highly resistant to vibration, scuffing and other mistreatment it might be subjected to in an aircraft installation. It is almost impossible to short out the inner wire with the outer sheath, the company claims.

• **Stable.** The semi-conductor selected for this cable is highly stable, both chemically and thermally. Its calibrated resistance value remains practically unchanged after repeated exposure to temperature extremes. Its characteristics of resistivity, stability and uniformity can be controlled on a production basis.

The cable, which is designed to be strung through all potentially fire-hazardous areas in an aircraft, has a standard outside diameter of .070 in.

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OFF THE LINE

Capital Airlines plans to equip its entire Constellation fleet with Sperry engine analyzers, according to L. H. Caldwell, the carrier's chief engineer. The fleet of 12 Connies—seven 749 models and five 049s—were bought from KLM Royal Dutch Airlines. Capital has been service-testing the Scintilla ignition analyzer along with the Sperry unit, but in the interests of standardization will install only the latter, Caldwell told AVIATION WEEK. The carrier had no complaints against the Scintillas. Capital already has Sperry units on two 749 Connies and five more on the shelf to go into the 049s. Five additional Sperry instruments will be bought for the remaining 749s.

Pan American World Airways' Pacific-Alaska Div. is moving into its recently completed engine overhaul shop at its San Francisco Airport base. The new $500,000 facility will allow PAA to overhaul all engines used on its fleet, including Boeing Stratocruisers and Douglas DC-4s. Work had been done by outside contractors. Overhaul shop will increase current payroll of 3,800 by approximately 120 employes.

The third of a fleet of three Handley Page Marathons was recently ferried from London to Rangoon, Burma, in four days. The four-engine plane stopped at Rome, Athens, Nicosia, Baghdad, Bahrein, Sharjah, Karachi, Delhi and Calcutta. Before landing at Rangoon for delivery to Union of Burma Airways, the Marathon demonstrated its handling characteristics with a two-engine fly-by with both starboard propellers feathered.

Central Aviation & Marine Corp., MacArthur Airport, L. I., N. Y., has been awarded Civil Aeronautics License 3585 covering Class 1 and Class 2 accessories, limited accessories and limited magnetic and fluorescent inspection.

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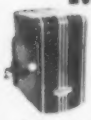
Milestones in the March of Progress



1936 First Production Combustion Type Vehicle Heater
South Wind Model 781, 6,000 BTU/hr.

1941 First Production Combustion Type Aircraft Heater
South Wind Model 789, 8,500 BTU/hr.; Model 790, 80,000 BTU/hr.; Model 791, 40,000 BTU/hr.

1943 South Wind Model 900, 200,000 BTU/hr.

1943 South Wind Model 911, 160,000 BTU/hr.

1944 South Wind Model 906, 50,000 BTU/hr.

1944 South Wind Model 912, 175,000 BTU/hr.

1944 South Wind Model 917, 25,000 BTU/hr.

1945 South Wind Model 920, 100,000 BTU/hr.

1945 South Wind Model 921, 200,000 BTU/hr.

1945 South Wind Model 979, 18,000 BTU/hr.

1945 South Wind Model 68077, 800,000 BTU/hr.

1945 South Wind Model 919, 290,000 BTU/hr.

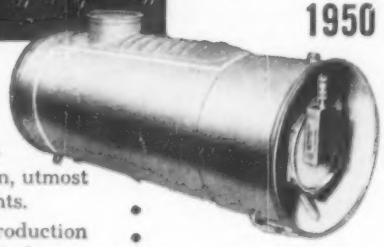
1946 South Wind Model 918, 400,000 BTU/hr.

1948 South Wind Model 930, 100,000 BTU/hr.

1949 South Wind Model 910, 235,000 BTU/hr.

1949 South Wind Model 929A, 700,000 BTU/hr.

1950 South Wind Models 995, 996, 999, Inert Gas Generators



1951 South Wind Model 960, 25,000 BTU/hr.

1952 South Wind Model 997, Inert Gas Generators

1952-1953 South Wind Model 929C, 600,000 BTU/hr.

Participating in this March of Progress . . .

South Wind products have been used in aircraft or equipment manufactured by:

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Bell Aircraft Corporation
Boeing Airplane Company
Cessna Aircraft Company
Chrysler Airtemp Construction Co.
Consolidated-Vultee Aircraft Corp.
Curtiss-Wright Corporation
Douglas Aircraft Company, Inc.
Fairchild Engine & Airplane Corp.
Grumman Aircraft Engineering Corp.
Hughes Aircraft Company
Lockheed Aircraft Corporation
Glenn L. Martin Company
North American Aviation, Inc.
Northrop Aircraft, Inc.
Piper Corporation

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- Vacuum tubes
- Gyros
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- Relays
- Aircraft Control Systems

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NEW AVIATION PRODUCTS

Conversion Kits for 28-Seat DC-3s

Civil Aeronautics Administration restrictions regarding minimum aisle width in new four-abreast seating arrangements in DC-3s have been overcome by several airlines through use of a seat conversion kit put out by Transport Equipment Co.

The kit consists of 14 TE314-2N double seats, four of which are slightly narrower than the rest. This offsets diminishing width of the cabin in the front and back, so mandatory aisle width of 13 in. can be maintained throughout.

Extra leg room is obtained from inboard side panels which closely follow the cabin contour. Also, center armrests can be removed for more space. First two seats forward can be reversed to form a compartment.

In addition to seats, the kit includes channel or hat sections and engineering instructions. All that is needed for completion is plywood flooring and AN hardwood, the company says. CAA has approved installation.

Transport Equipment Co., Burbank, Calif.

No Moving Parts in Liquid Level Control

An electronic device for accurate control of liquid level in tanks has been developed by Haledy Electronics Co.

The new control uses no floats, bellows or other moving parts. Its only contact with the liquid is by stainless steel rods suspended at a predetermined level. Accuracy is said to be completely independent of pressure or temperature.

The device uses cold cathode tubes, eliminating the possibility of hot tube failure. These tubes, the Haledy TT-1 triode 5, operate instantaneously and have virtually unlimited life, the company says. TT-1 tubes do not require a filament or plate transformer or circuitry. No warmup time or standby current is needed.

The great accuracy of the set is attributed by Haledy to the high amplification factor (2½ million) of the TT-1 tube. This allows current across the stainless steel electrodes suspended within the tank to be less than two micro-amperes at low voltage, making the system safe for a wide range of liquids, the firm says. Contact of liquid with electrodes causes current to flow.

Haledy Electronics Co., 57 William St., New York 5.

High-Pressure Switch

A series of pressure-actuated switches for use in 3,000-psi. aircraft hydraulic and pneumatic systems is being produced by Wallace O. Leonard, Inc.

The pressure-sensitive element in these units is a spring-loaded piston. The company claims use of the piston provides insensitivity to over-pressure even, in low-pressure switches, and to vibration. Special measures have been taken to reduce friction in this design, the firm says.

The switches can be supplied for pressures ranging from 40 to 3,000 psig. The electric switch actuated by the pressure piston is the V-3 Microswitch, having a current rating of 5 amp. inductive

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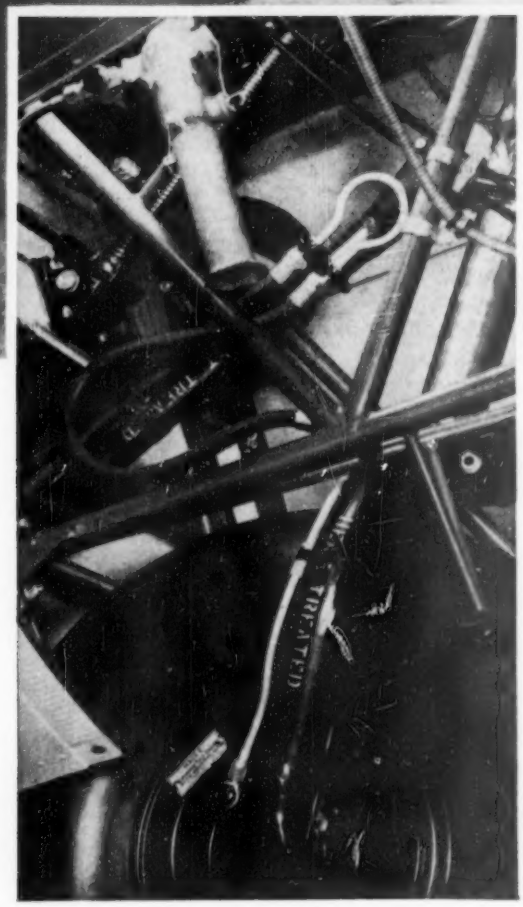

ADAPTABLE to every size and type of aircraft, Shelby Seamless Tubing combines to the highest degree the factors of strength, safety, and workability. Although rugged and shock-absorbent, Shelby Seamless is relatively light. It is uniform throughout, dimensionally accurate, easy to bend and shape to almost any form. These qualities, plus its excellent machining and superior welding properties, make Shelby Seamless Tubing ideal for incorporation into landing gears, engine mounts, wing spars, longerons, fuselage struts and tail assemblies.

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at 27 v. d.c. up to 50,000 ft. altitude. The switch conforms to AN 3234. The whole assembly is contained in a sealed housing designed to withstand a minimum pressure of 20 psig.

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A series of solenoid-actuated Micro-Switch relays are being produced to Air Force and commercial specifications for airborne and ground equipment use.

The units, designated the "57" series, are built for high-G conditions and are available in various pole-throw arrangements, some among these meeting specifications AN3210-1 and AN3216-1. Contact ratings range from 3 to 25 amp. The relays are designed for continuous service, weight 5.7 oz. and operate in 24-28 v. d.c. systems.

Electrical Products Corp., 1100 N. Main St., Los Angeles, Calif.

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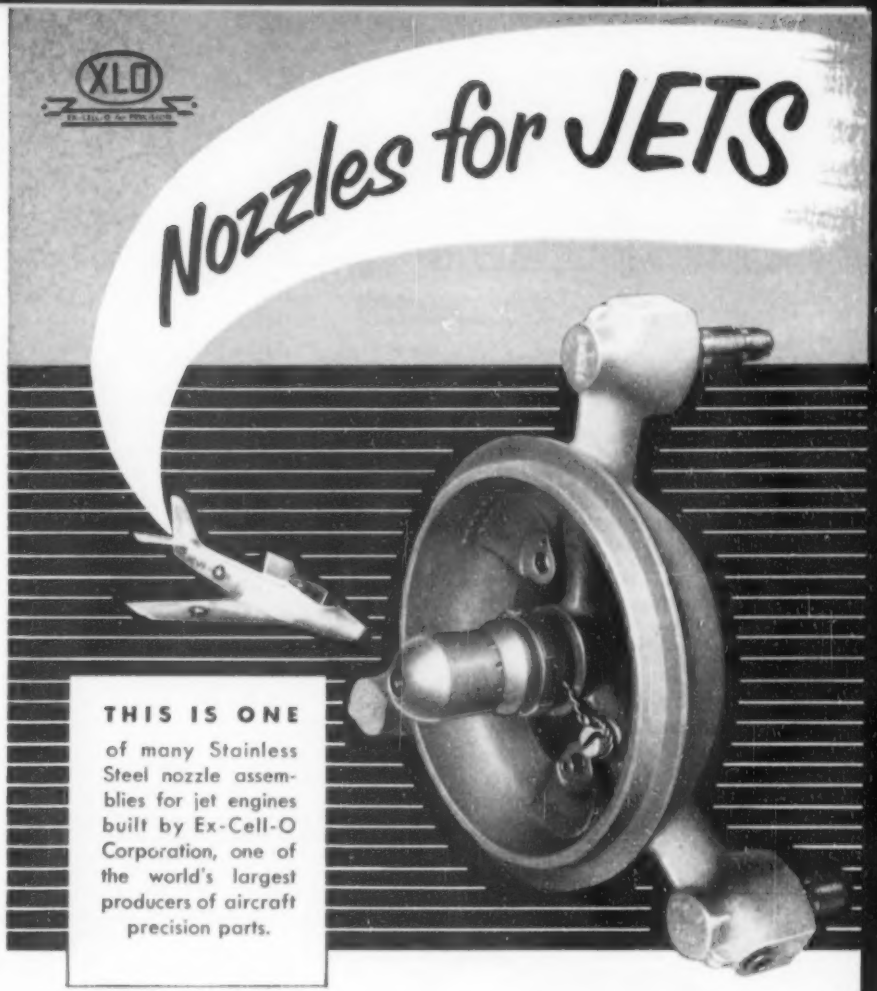

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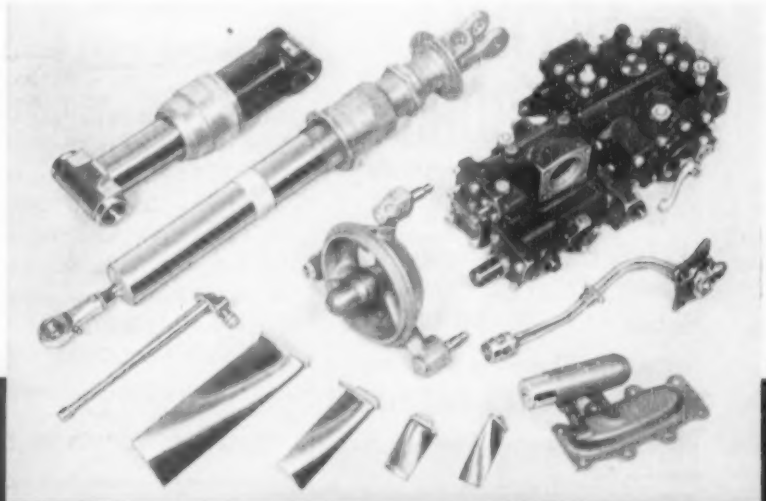

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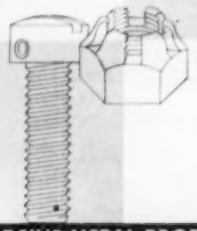

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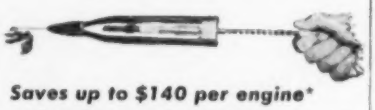
in less time than it takes to do one by any other method



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with split-second twisting action. 3 tools in 1 – pliers, cutters, twisters. Two sizes – 12" and 9". Now used by Army, Navy, Air Force, Pratt & Whitney, GE, TWA and hundreds of others. *Satisfaction guaranteed.* $19.50 each. $18.50 ea. in dozens. FOB, Sacramento, Calif.

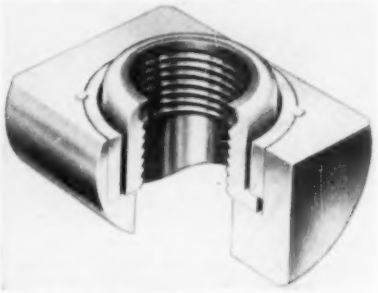
**Sure, we have proof! Write for detailed report.*

RALPH C. ROBINSON CO.
Dept. AW6
BOX 494, NORTH SACRAMENTO 15, CALIF.

perature control (from 205 to 250F) of the compound. It has two spray guns permitting simultaneous use by two operators. The machine can prepare engines both for storage and for shipment.

Machine has a special nozzle which throws out a circular sheet of pickling compound at right angles to the body of the nozzle. This is necessary to meet the specification requirement for "application of an even coating of hot pickling compound over all internal surfaces of the cylinders by spraying through sparkplug openings." Danger of applying excessive amounts of compound, either too cool or too hot, is practically eliminated, the company states.

Texas Metal and Mfg. Co., 6114 Forest Park Rd., Dallas, Tex.



Aligning Barrel Nut

A self-aligning barrel nut, designed to reduce aircraft assembly costs in critical areas where highly concentrated loads are encountered, has been announced by Shur-Lock Corp.

The nut is said to be 40% lighter in weight than previous types. It is installed by reaming into the load-bearing structure, inserting the nut into the hole and securing it with a retaining spring. Design of the barrel is such that it distributes the load into the surrounding structure. The self-aligning feature helps prevent cross threading and misfits, reducing the need for extremely close tolerances, Shur-Lock says.

The nut is made in three pieces: a 75S-T6 aluminum barrel, a threaded steel bushing, and a steel retainer. Ears at the base of the threaded steel bushing float in the slotted section of the retainer. The knurled retainer is pressed in place and punch staked. The nut is available in thread sizes from $\frac{1}{4}$-28 up to $\frac{7}{8}$-14.

Shur-Lock Corp., 9010 Bellanca Ave., Los Angeles 45.

Reflecting Cover

A cockpit covering of high reflectivity, originally developed for the Air Force to eliminate clouding of plastic sections caused when ordinary paulins are exposed to the hot sun, now is available

A Breeze from JOY AXIVANE® AIRCRAFT FANS

for a Tornado

The North American B-45 "Tornado" Bomber, like most U. S. aircraft, has many features designed solely for the flight personnel's comfort.

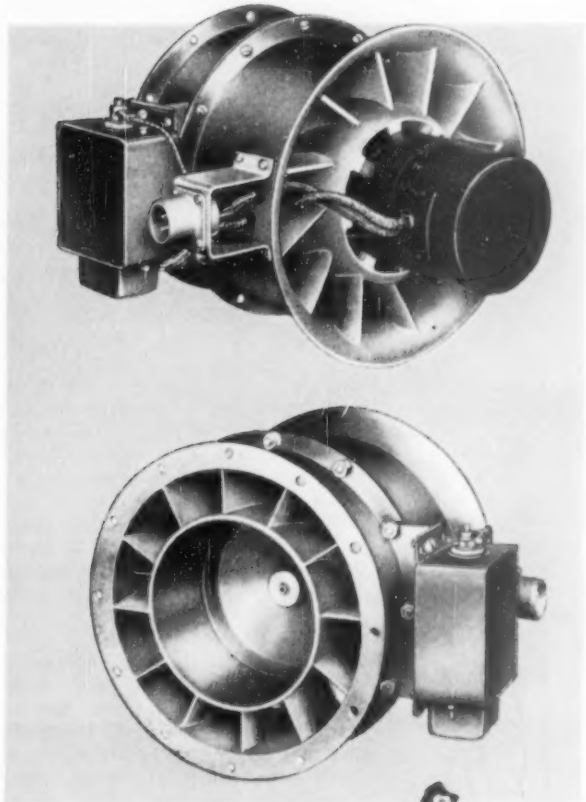
Acting on the logical assumption that a more comfortable pilot is a better pilot, North American engineers called for a cockpit-cooling system of Joy Axivane Fans to keep the flight personnel from melting while waiting for take-off on hot days. When the "Tornado" is airborne, the fans are used in conjunction with a heating system to furnish warm air for canopy defrosting. On the RB-45 photo-reconnaisance bomber, the same fans also keep the camera ports free from frost or fog.

The versatility of this system is largely dependent upon that of the Joy AXIVANE Fan. The fans used on the B-45A, B-45C, and RB-45C provide 250 CFM at 6.5" W.G., yet they are only 6.5" in diameter and weigh but 9 lbs.

● Joy designs and builds each fan to the exact requirements for which it is intended. Each fan, therefore, is custom-engineered for highest efficiency. For many purposes stock fans can be supplied from the extensive line already designed. Both single and two-stage units available. Optional features include straight or flared inlets, beaded or flanged connections, radio noise-filters, anodization, and cooled motors where required.

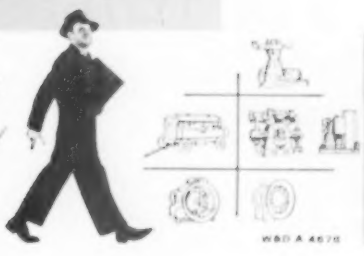
★ ★ ★ ★ ★

Here are some of the many uses for JOY AXIVANE Aircraft fans: Windshield de-frosting, windshield or wing de-icing, cabin heating, cabin ventilating, cockpit heating, cooling radio and electronic equipment, cooling voltage regulators, oil cooling, gear-box cooling, instrument cooling, air recirculation, and high-altitude pressurizer boosting. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.,*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



Consult a Joy Engineer

for Vaneaxial Fans . . . Compressors, Vacuum Pumps and Boosters . . . Oxygen Generators



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Uncoated Cloth Tapes • Mystik Protecto-Mask • Mystik Spra-Mask • Mystik Sand-Blast
Mystik Dri-Pipe Insulation • Mystik Freezer Tapes • Mystik Book Repair Tapes

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for civilian plane use from E. I. du Pont de Nemours and Co.

The material, V-Cockpit Cover No. 3, has a nappy fabric base with a high-luster aluminum top coating. The cover reflects most of the heat that strikes it. It has been adopted as the specification standard by Wright-Patterson AFB, Dayton, according to the company.

E. I. du Pont de Nemours & Co., Wilmington, Del.

ALSO ON THE MARKET

Cold test chambers that provide large chilling capacity in small floor space are made in sizes from 1.5 to 4 cu. ft. and in temperature ranges from −10 to −125F.–Sub-Zero Products Co., Cincinnati 29.

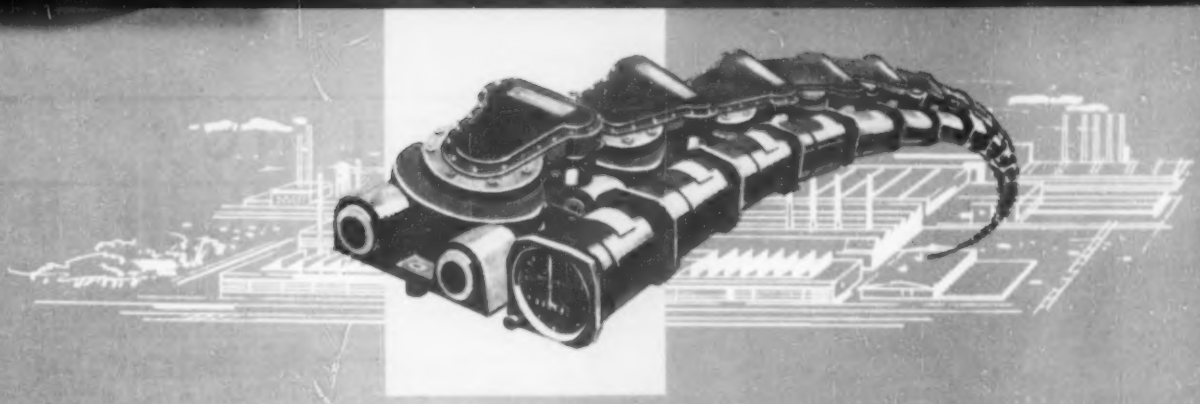
Gauge Protector automatically shuts off pressure line when gauge capacity is exceeded; for pressures from 15 to 15,000 psi. Valve opens automatically when pressure drops to normal.–Republic Mfg. Co., 1930 W. 77 St., Cleveland 2.

Warndicator that notifies pilot of excessive oil pressure drop during engine operation is simply installed; approved by CAA.–Regal Air Corp., 500 Fifth Ave., New York.

Twin tumbling machine permits two lots of parts to be deburred at the same time, and can be adapted to deburr as many as four separate lots; unlined or lined with vinyl plastic.–Rampe Mfg. Co., 3320 St. Clair Ave., Cleveland 14.

Precision electrical resistors for high-temperature military applications are silicone-impregnated and use fiber glass insulated wire to increase wattage ratings 5 to 10 times over those of commercial precision wirewounds of the same dimensions. Type G-196E resisto, for example, dissipates 8 watts compared to 1 watt for its commercial counterpart.–Shallcross Mfg. Co., Collingdale, Pa.

Sunform glass cloth for low-pressure laminating is pre-impregnated with polyester resin plus catalyst, and is ready for forming on arrival. It unrolls like cloth and cures in two to five minutes at temperatures of 250 to 300F. Material can be stored before use at normal room temperatures for six months. It has high tensile and flexural strength combined with light weight. Free-flowing resin in cloth provides void-free laminates, even with the most intricate molds, says developer.–Electro-Technical Products div., Sun Chemical Corp., 10th St. and 44th Ave., Long Island City 1, N. Y.



Where Flowmeters Are Concerned...

Eclipse-Pioneer gravimetric fuel flowmeter systems are standard on all military aircraft and on 80% of all commercial planes. There are two solid reasons for this overwhelming preference. First, Eclipse-Pioneer flowmeters measure consumption in terms of pounds—the basic reference of fuel energy. This means the readings on the panel-mounted indicator may be used direct without the necessity of calculating and applying corrections for specific gravity changes as in a volumetric system. Second, the accuracy of Eclipse-Pioneer flowmeters is safeguarded by the most extensive, most precise test facilities in the industry—facilities which include specially-built calibration stands capable of testing flowmeter accuracy *to within 3 ounces per 100 lbs. of fuel.* Eclipse-Pioneer flowmeters are available for single- or multi-engine aircraft . . . reciprocating or jet . . . for on-board consumption or in-flight refueling purposes, and in capacities ranging all the way from 30 P.P.H. to 360,000 P.P.H. Where flowmeters are concerned, Eclipse-Pioneer stands alone. That's because only Eclipse-Pioneer has the quantity and quality of facilities to build the types of flowmeters demanded by the industry.

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- Automatic Pilot and Flight Path Control Equipment
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FACTS FOR FILING

U.S. Civil Transport Aircraft

DOUGLAS TRANSPORTS

MODEL	CERTIFICATION DATE	PURPOSE	GROSS WEIGHT	TYPE	POWER PLANT	SPEED HIGH CRUISE		ULTIMATE RANGE MI.	CONSTRUCTION & MATERIALS	REMARKS
ACTIVE										
M-1-2-3	1926	MAIL	4,968	BIPLANE	1 LIBERTY	145	110	650	TUBULAR ROD FUSELAGE - SPRUCE & WOOD WINGS-FABRIC COVERED	FIXED LANDING GEAR - WOOD PROPELLER
C-1	1925	UST	—	BIPLANE	LIBERTY 12	121	—	—	"	"
DC-1	1933	P-12-18 CARGO-1000 LBS	17,500	LOW WING MONOPLANE LAND	2 SW-1820 F	210	190	1000	GENERALLY 24S INTERNALLY BRACED	RETRACTABLE L G H S 3 BLADE HYDROMATIC CS
DC-2	1934	P-14 CARGO-1960 LBS	18,560	"	"	"	200	1060	"	"
DC-3	1936	P-21-24 (14 UST)	25,200	"	2 P&W 1830 OR W 1820 G	211	191	1480	"	"
DC-4 (C-54)	(1943) 46	P-44 CARGO-5-7 LBS	73,000	"	4 P&W R-2000	234	219	4240	"	"
DC-6	1947	P-52 CARGO-7500 LBS	93,000	"	4 P&W R-2800	350	304	3570	GENERALLY 24S INTERNALLY BRACED + T51	RETRACTABLE L G PRESSURIZED A C W OR H S FFCSR PROPS
DC-6A	1951	CARGO 30,850 LBS		"	"	370	315	3400	"	RETRACTABLE L G PRESSURIZED 4 H S FFCSR PROPS
DC-6B	1951	P-68D CARGO-11,950 LBS	107,000	"	4 P&W R-2800 CB-16	371	315	3720	"	"
DC-7	1953	P-69D CARGO-15,580 LBS	122,000	"	4 W 3350 COMP	393	360	4445	" 6 T	"
INACTIVE										
DC-4E	1939	P-C PASSENGER SPACE INCOMPLETED	65,000	LOW WING MONOPLANE LAND	4 P&W R-2800	242	200	1750	GENERALLY 24S INTERNALLY BRACED	1 ONLY EXPERIMENTAL (ABANDONED)
DC-5A	1940	P-22 CARGO-3000 LBS	23,500	"	2 W-1920 H	265	241	1165	"	11 ONLY EXPERIMENTAL (ABANDONED)
DC-7 (OLD)	1946	P-CARGO-11000 LBS	82,000	"	4 P&W 4360	306	262	5000	"	(ABANDONED)
DC-8 (OLD)	1947	P-38-48 CARGO-1000 TO 6000 LBS	350,000	LOW WING MONOPLANE LAND (PUSHER)	2 V-1710 ALLISON	290	270	—	"	EXPERIMENTAL (ABANDONED) 3 BLADE CONTRA ROTATING PROPELLERS
DC-9	1948	P-28 CARGO-5500 LBS	31,445	LOW WING MONOPLANE LAND	2 W-1820 (2 SPEED)	—	258	2590	"	EXPERIMENTAL (ABANDONED) 2 C W ELECTRIC PROPELLERS
SUPER DC-3	1950	P-31 C-3030 LBS	31,000	"	SW-820C -9H	270	250	2200	"	2 H S FULL FEATHERING PROPS

P = PASSENGER C = CARGO W = WRIGHT — P&W = PRATT & WHITNEY H S = HAMILTON STANDARD C W = CURTISS WRIGHT — FFCSR = FULL FEATHERING CONSTANT SPEED REVERSE COMP = COMPOUND CS = CONSTANT SPEED — DST = SLEEPER T = TITANIUM D = DAYPLANE LG = LANDING GEAR

BOEING TRANSPORTS

MODEL	CERTIFICATION DATE	PURPOSE	GROSS WEIGHT	TYPE	POWER PLANT	SPEED HIGH CRUISING		ULTIMATE RANGE MI.	CONSTRUCTION & MATERIALS	REMARKS
ACTIVE										
B-1	1919	P-2 4 MAIL	3,850	BIPLANE BOAT	1 HALL SCOTT OR LIBERTY	90	80	400	WOOD WING FABRIC	WOOD PROPELLER (1 BUILT) BOAT MAIL
40A	1927	P-2 C-1200	4,652	BIPLANE LAND	1 P&W WASP	135	125	550	TUBE & FABRIC FUSELAGE & FABRIC WINGS	2 BL ADJ METAL PROP FIXED LANDING GEAR
80A	1928-30	P-18 CARGO-1778 LBS	17,500	BIPLANE LAND	3 P&W HORNET A	139	125	460	WG STRU TUBE DUAL REC 160 RIC COVERED	3 BL ADJ METAL PROP FIXED LANDING GEAR
221 MONOMAIL	1930	P-6 CARGO-750 LBS	8,000	LOW WING MONOPLANE LAND	1 P&W HORNET B	158	135	600	ALL METAL (75) INTERNALLY BRACED R&W & METAL SKIN	3 BLADE ADJ METAL PROP RETRACTABLE GEAR
247D	1934-35	P-10 C-3400 LBS	13,650	LOW WING MONOPLANE LAND	2 P&W WASP	200	189	745	ALL METAL (24S) STREAMLINED INTERNALLY BRACED	3 BLADE ADJ METAL PROPS RETRACTABLE GEAR REVISED
314-307B STRATOLINER	1940	P-33 C-7681 LBS	45,000	LOW WING MONOPLANE LAND	4 W 1820 G-105	246	220	2390	ALUMINUM ALLOY AND STEEL	(4) SUPERCHS 3 BL HYDROMATIC FFCS PROPS PRESSURIZED
A-314 (CLIPPER)	1941	P-85 CARGO-10826 LB	84,000	HIGH WING BOAT	4 W G-2600	199	164	5200	"	H S HYDROMATIC FFCS PROPS
377 STRATOCRUISER	1948	P-89 CARGO-17500 LBS	145,800	LOW WING MONOPLANE	4 P&W 4360 T 50 WING	351	300	4600	"	H S OR C W PROPELLERS FFCSR
INACTIVE										
417	1947	P-20 C-11560 LB	18,750	HIGH WING MONOPLANE	2 W-CTBA	224	182	—	"	NOT BUILT H S FFCS PROPS
431	1945	P-30 CARGO-29871 LBS	56,000	HIGH WING MONOPLANE	2 P&W R-2800	280	180	1000	"	NOT BUILT (DC-5 REPLACEMENT) H S FFCS PROPELLERS

P = PASSENGER C = CARGO W = WRIGHT — P&W = PRATT & WHITNEY H S = HAMILTON STANDARD MONO = MONOPLANE — FFCS = FULL FEATHERING CONSTANT SPEED FFCSR = FULL FEATHERING CONSTANT SPEED REVERSE ADJ = ADJUSTABLE — WD = WELDED BL = BLADE T = TURBO C W = CURTISS WRIGHT

The history of American transport aircraft development is traced in these charts covering projects of Douglas, Boeing, Consolidated Vultee, Lockheed, Curtiss-Wright and Glenn L. Martin. The charts were prepared by the engineering department of American Airlines.

Aviation Week, 6-1-53

CONSOLIDATED-VULTEE TRANSPORTS

MODEL	CERTIFICATION DATE	PURPOSE	GROSS WEIGHT	TYPE	POWER PLANT	SPEED HIGH CRUISING		ULTIMATE RANGE MI.	CONSTRUCTION & MATERIALS	REMARKS
ACTIVE										
COMMODORE	1929	P-20 75 CU FT	17,600	HIGH WING MONO BOAT	2 P&W HORNET	128	108	1000	ALUMINUM ALLOY & FABRIC WING ALUMINUM HULL	BOAT
FLEETSTER	1931	P-6 60 CU FT	5,900	HIGH WING MONO LAND	1 P&W HORNET B	180	153	750	PLYWOOD FUSELAGE ALUMINUM WING & TAIL	FIXED PITCH PROPELLER FIXED GEAR
VULTEE V1A	1934	P-8 C-1500 LBS	8,500	LOW WING MONO LAND	WRIGHT 620 RF2	235	215	—	ALUMINUM MONOCOQUE	RETRACTABLE GEAR ADJUSTABLE PROPELLER
PBY-5A	1940	P-22	28,000	HIGH WING MONO AMPHIBIAN	2 P&W 1830	195	139	780	ALUMINUM ALLOY FABRIC COVERED CONTROLS	MILITARY CONVERSION
240	1947	P-40 CARGO-3000 LBS	41,780	LOW WING MONO LAND	2 P&W R-2800	328	291	1620	ALUMINUM ALLOY	RETRACTABLE-TRICYCLE GEAR H S OR C W FFCSR
340	1948	P-44 CARGO-3400 LBS	47,000	LOW WING MONO LAND	2 P&W R-2800-CB-16	317	284	1930	ALUMINUM ALLOY	RETRACTABLE TRICYCLE GEAR H S OR C W FFCSR
INACTIVE										
39	1948	P-48 CARGO-16,800 LBS	66,800	HIGH WING MONO LAND	4 P&W R-2000	300	240	3300	ALUMINUM ALLOY	EXPER ONLY-RETRACTABLE-TRICYCLE GEAR
110	1944-45	P-50 C-2080 LBS	38,000	LOW WING MONO LAND	2 P&W R-2800	314	270	1280	ALUMINUM ALLOY	EXPER ONLY-RETRACTABLE-TRICYCLE GEAR
C-99	1943	P-204 OR 100,000#	328,000	MID WING MONO LAND	6 P&W R-4360	299	235	4780	ALUMINUM ALLOY	EXPERIMENTAL ONLY 2 DECKS

P = PASSENGER C = CARGO — P&W = PRATT & WHITNEY H S = HAMILTON STANDARD MONO = MONOPLANE — FFCS = FULL FEATHERING CONSTANT SPEED FFCSR = FULL FEATHERING CONSTANT SPEED REVERSE EXPER = EXPERIMENTAL

LOCKHEED TRANSPORTS

MODEL	CERTIFICATION DATE	PURPOSE	GROSS WEIGHT	TYPE	POWER PLANT	SPEED HIGH CRUISING		ULTIMATE RANGE MI.	CONSTRUCTION & MATERIALS	REMARKS
ACTIVE										
VEGA	1926 & 1929	P-4-6 M-21 CF	3470 TO 4650	HIGH WING MONO	1 W-J5 OR 1 P&W WASP	190	172	660	MOLDED PLYWOOD	FIXED GEAR PROPS AVAILABLE
ORION	1930	P-6 M-18 CF	5400	LOW WING MONO	1 P&W WASP	227	205	720	"	RG PROPS CONTROLLABLE
ELECTRA L-10	1933	P-10 C-9009	10,500	LOW WING MONO	2 P&W WASP JR	202	156	880	AL ALLOY INTERNALLY BRACED	RG PROPS CS
L-12A	1935	P-6 C-8659	9200	LOW WING MONO	2 P&W WASP JR	253	148	850	"	RG PROPS CS
L-14H	1937	P-11 C-2700	17,500	MID WING MONO	2 P&W HORNET	244	187	2080	"	RG PROPS CS
LOD STAR L-18	1939	P-14 C-5400	17,800	MID WING MONO	2 P&W HORNET	240	180	1875	"	RG PROPS CS
CONSTELLATION L-049	1939	P-51 C-14,250	86,250	LOW WING MONO	4 WRIGHT 3350	340	199	5000	"	PR RG PROPS FFCS
L-749	1945	P-44 C-13,500	102,000	LOW WING MONO	4 WRIGHT 3350	346	215	5430	"	PR RG PROPS FFCSP
L-1049	1950	P-75 C-13,120	120,000	LOW WING MONO	4 WRIGHT 3350	333	236	5300	"	PR RG PROPS FFCSP
L-1049C	1950	P-65 C-15,860	133,000	LOW WING MONO	4 WRIGHT COMPOUND	362	259	4930	"	PR RG PROPS FFCSR
INACTIVE										
EXCALIBUR (L44)	1939	P-21 C-5500	27,500	LOW WING MONO	4 P&W WASP	241	180	2180	"	RG PROPS CS
SATURN L-75	1944	P-14 C-14500	16,000	HIGH WING MONO	2 W-1820 CYCLONE	252	189	2040	"	RG PROPS FFCS
CONSTITUTION L-89	1943	P-168 C-34,109	184,000	MID WING MONO	4 P&W 4360	307	227	1900	"	RG PROPS FFCS

M = MAIL C = CARGO (LBS) — P = PASSENGERS C.F. = CUBIC FEET — RG = RETRACTABLE GEAR PR = PRESSURIZED — FFCSR = FULL FEATHERING CONSTANT SPEED REVERSE FPCS = FULL FEATHERING CONSTANT SPEED W = WRIGHT

CURTISS-WRIGHT TRANSPORTS

MODEL	CERTIFICATION DATE	PURPOSE	GROSS WEIGHT	TYPE	POWER PLANT	SPEED HIGH CRUISING		ULTIMATE RANGE MI.	CONSTRUCTION & MATERIALS	REMARKS
ACTIVE										
C-46	1940	P-40 OR C-2300 CU FT	50,000	MID WING MONO	2 PRATT & WHITNEY R-2800	255	242	1000	ALUMINUM ALLOY	RETRACT GEAR
INACTIVE										
KINGBIRD	1930	P-8	8115	HIGH WING MONO	9 WRIGHT J-6 300	138	115	640	STEEL TUBE FABRIC	FIXED GEAR
CONDOR	1929	P-10	17,900	BIPLANE LAND	2 CURTISS CONQUEROR	168	135	800	ALUM & STEEL TUBE FABRIC	FIXED GEAR
T-32	1933	P-20 OR P-28	17,900	BIPLANE LAND	2 WRIGHT 1820F	190	147	800	STEEL TUBE FABRIC	RETRACT GEAR (10 PRODUCTION SLEEPER PLANE)

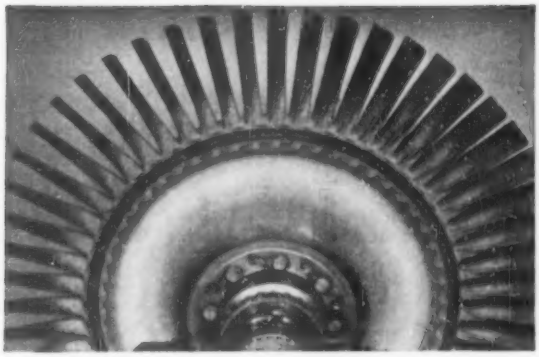
GLENN L. MARTIN TRANSPORTS

MODEL	CERTIFICATION DATE	PURPOSE	GROSS WEIGHT	TYPE	POWER PLANT	SPEED HIGH CRUISING		ULTIMATE RANGE MI.	CONSTRUCTION & MATERIALS	REMARKS
202	1947	P-36 C-3280	38,900	LOW WING MONO LAND	2 PRATT & WHITNEY R-2800	311	288	2020	ALUMINUM ALLOY	RETRACTABLE TRICYCLE GEAR H S OR C W FFCSR
404	1952	P-40 C-1000	43,860	"	"	312	284	1200	"	"

P = PASSENGERS C = CARGO — D = DAY SEATS S = SLEEPER BERTHS — MONO = MONOPLANE C W = CURTISS WRIGHT — FFCSR = FULL FEATHERING CONSTANT SPEED REVERSE H S = HAMILTON STANDARD

The NIMONICS

high-temperature alloys that offer many useful properties.



HERE IS HOW the Nimonic "80"A blading of a J-42 turbine looks after 500 hours of test running. The blades, according to Pratt & Whitney, are in almost as good condition as they were at the start of the test.

As time passes, you'll hear the Nimonics talked about with increasing frequency.

And with good reason! The Nimonic alloys (we'll discuss two of them individually in a moment) are high-temperature alloys. Their characteristics are frequently sought by aircraft designers.

Let's consider Nimonic "75" (available in sheet only) first. Offering high resistance to oxidation and corrosion, it is particularly useful wherever a limited creep deformation can be tolerated under steady load and at high operating temperatures.

Up to now, Nimonic "75" has been used mainly for nozzle guide vanes, flame tubes and other combustion chamber components in British and American aircraft turbines. But its field, of course, is not strictly limited to these applications. Wherever inlet temperatures push above 1450° F., Nimonic "75" may well be kept in mind. It provides:

- High creep and fatigue strength
- High oxidation resistance at elevated temperatures
- A low coefficient of expansion, similar to mild steel (holds distortion to a relatively low level)

The second of these high-temperature alloys (available in bar stock only) is Nimonic "80"A. This is the standard material used for moving blades in nearly every production aircraft turbine in Great Britain. It is the material used, too, for turbine blades of Pratt & Whitney J-42 Turbo-Wasps, the jets that have flown more than 150,000 hours *without a single turbine blade failure.* The picture above shows the excellent condition of these blades after a 500-hour test run.

Essentially a forging alloy, Nimonic "80"A compares favorably with other alloys designed for long periods of high-temperature service under stress. While its superior creep resistance is largly responsible for its suitability as a blade material, its high oxidation resistance at elevated temperatures and its high fatigue strength under stress are also important.

Both of these Nimonic alloys have working qualities that greatly increase their range of usefulness to the designer. They can be machined by commonly-used methods, and with standard equipment. Their toughness and capacity for work-hardening, however, call for careful tool placement, fairly slow cutting speeds and generous use of lubricant.

Welding is readily accomplished by any of these methods: oxy-acetylene, inert gas arc, metallic arc, flash, spot, stitch, seam or butt. Detailed information on procedures is available, and Inco's Technical Service Section will be glad to furnish it upon request.

In fact, when you need help with any metal problem involving high temperatures, call on Technical Service. There's no charge, no obligation.

Consult your Distributor of Inco Nickel Alloys for the latest information on availability from warehouse and mill. Remember, too – it always helps to anticipate your requirements well in advance.

The International Nickel Company, Inc.,
67 Wall Street, New York 5, N. Y.

Approximate Composition

	NIMONIC "75"	NIMONIC "80" A
Carbon	0.08 – 0.15%*	0.10 max.
Manganese	max. 1.00	1.00 max.
Sulfur	max. 0.015*	0.015 max.
Silicon	0.30 – 0.80	1.00 max.
Chromium	19.00 – 21.00	19.00 – 22.00
Titanium	0.25 – 0.50	2.00 – 2.75
Iron	max. 2.00	2.00 max.
Copper	max. 0.50	0.50 max.
Aluminum	max. 0.40	0.90 – 1.50
Nickel	Remainder	Remainder

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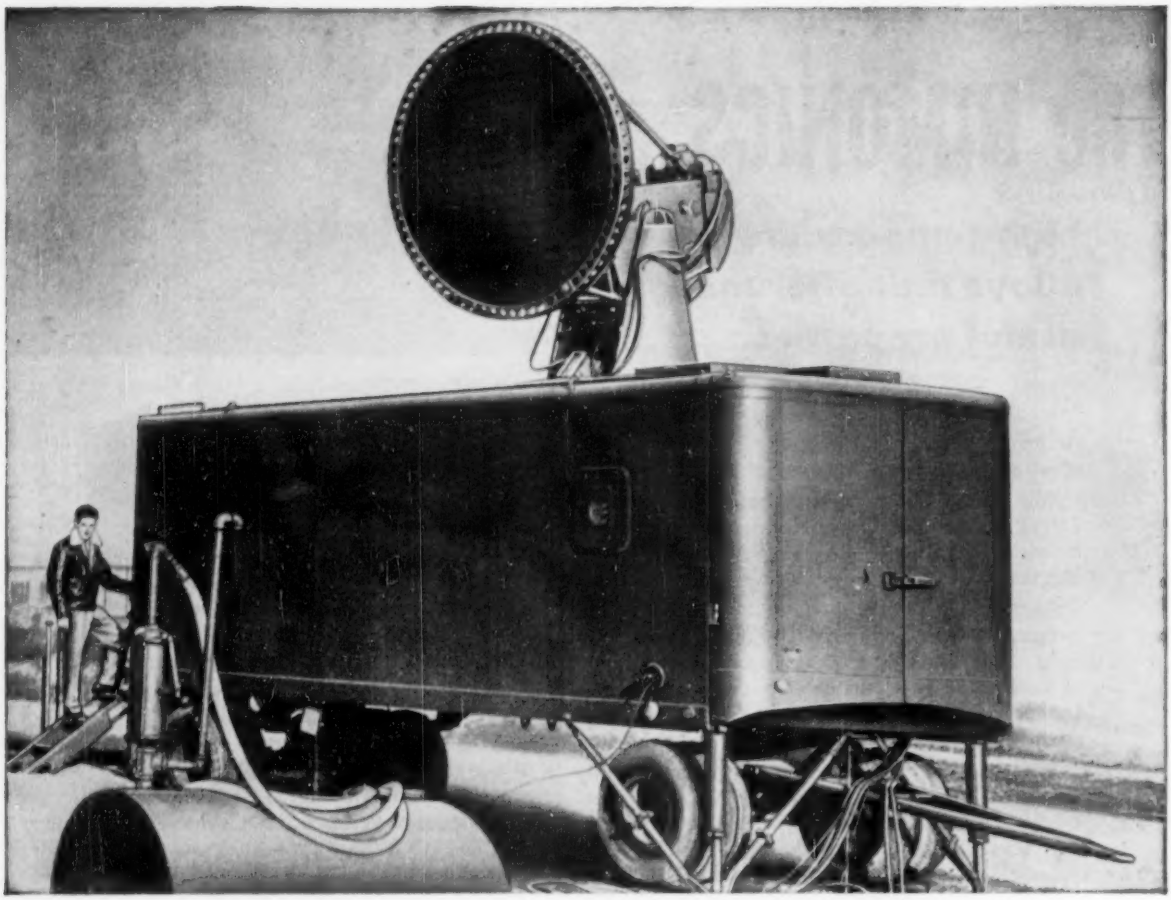

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Details are classified for security reasons. However, many improvements and refinements, make the device more informative, effective and flexible than its predecessors.

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CAB Launches New Airline Fares Study

- **Board plans to reset air carrier profit standards.**
- **New passenger rates will be proposed next year.**

By Lee Moore

The rate-making staff of Civil Aeronautics Board last week launched its first full investigation of airline passenger fares and profits. The Board set a mid-January deadline for the staff to come up with recommendations.

Here are Board instructions to the staff:

- **Determine "reasonable" profit.**
- **Analyze present fare structure.**
- **Recommend fare changes** by next January.

The outlook:

- CAB will propose new rates early next year.
- Airline hearings will be held on proposed rates with which they disagree.
- Board will order fare changes, probably after mid-1954. This program replaces the controversial general passenger fare investigation on which full-scale hearings were slated to start last month. Airlines persuaded the Board majority to drop that investigation. Some Board officials argue that the new study, followed by hearings, will be more efficient because it will narrow the issues before going to hearing. Other Board officials are skeptical.

▶ **Past Experience**—In the 14 years of CAB subsidy and regulation to date, the domestic trunklines have earned an average of 8% annually on their total investment and 12% for their common stockholders. In the last three years the trunklines have earned 12 to 14% on total investment and 22 to 25% annually on the common stock equity.

▶ **Staff Study Details**—Here is the final, official plan for carrying out the staff study, according to Gordon Bain, director of the rate-making Bureau of Air Operations:

- Survey present fare structure.
- Develop new rate and profit standards.
- Adjust present rates to fit the new standards.

Detailed application of the plan as outlined in the program memorandum approved by the Board last week:

The staff already has started an analysis of the existing fare structure. Major points of study include: variations among fares of different carriers and regions; fares on competitive and noncompetitive routes; fare taper with route distance and traffic density; fare differentials between first-class and coach; distribution of revenue between carriers on "joint fares" (where one airline sells a ticket which is used partly on another's route).

Major concern of the Board is the knotty problem of deciding a reasonable rate of profit return for an airline. It is essentially the problem of all commissions regulating rates or fares of companies granted monopoly-type franchises.

The Board-approved memorandum proposes to explore "alternative measures of reasonableness of a given fare structure."

Main standards CAB will analyze: return on total investment; return on common stock equity; relation of the sales profit margin to both; equalization of profit return at reasonable rate over the long term, many years instead of short-term fluctuations.

▶ **Staff Approach**—Here is the staff's detailed approach to the study of these issues, according to Bain and Rates Division chief Irving Roth:

Return on total investment. This is the annual rate of profit available to pay off both the debt and equity capital. It is the net profit after taxes (but before interest payments) as a percentage of total investment (long-term debt and equity). On the asset side of the balance sheet, the identical investment figure is arrived at by deducting current liabilities from total assets.

CAB always has used it as the main yardstick of "fair and reasonable" profit. In subsidizing an airline, the Board sets mail rates calculated to yield an 8% return for domestic airlines and 10% for an international route.

The Board uses this yardstick as a measure of sufficient subsidy (or high-enough passenger fare) to yield enough profit to gain investor confidence with which to build the industry without giving stockholders excess profits on their taxpayer-supported investment.

But the Board recently has turned also to another financial figure—profit return on the common stock equity.

This is the annual rate of profit available to the common stockholders' equity

Domestic Trunkline Earnings

	Net return on total investment* (1952)	Common stockholders' ret. on equity** (1952)	Net return on total investment* (1939-52)	Common stockholders' ret. on equity** (1939-52)
American	13%	29%	9%	18%
Eastern	12	19	12	15
TWA	15	26	4	4
United	16	22	9	11
Braniff	18	25	11	12
Capital	13	16	6	8
C&S	13	13	9	9
Colonial	..	..	..	..
Continental	16	19	12	14
Delta	35	36	16	18
Mid-Continent	***	***	11	13
National	24	36	13	16
Northeast	..	..	1	..
Northwest	4	3	4	3
Western	13	16	5	5
Total	**14**	**23**	**8**	**12**

* Net return on total investment is net profit (after taxes but before interest and preferred dividends) as a percent of equity and debt investment.

** Common stockholders' return on equity is net profit after interest, taxes and preferred dividend as a percent of common stockholders' equity.

*** Mid-Continent absorbed by Braniff 1952.

Source: CAB Bureau of Air Operations exhibit in General Passenger Fare Investigation.

—after all other charges including interest on debt and dividends to preferred stockholders.

This is what the common stock owners of a company get annually as a percentage of the average book value of their equity in that company during the year.

Company directors decide how much of this to plow back into new equipment for greater long-term appreciation of that equity, and how much of it they will pay out immediately in cash dividends.

CAB Bureau of Air Operations now proposes to study possible use of return on common stock equity as yardstick of "fair return."

Not only is it the actual measure of what the company owner gets, but it also is a way in which to avoid distortion of company profits by the debt ratio.

▶ **How It Works**—In the trans-Atlantic mail rate case of TWA and Pan American now pending, bureau counsel proposes to use an 11% return on common equity as a fair and reasonable return.

If return on total investment (equity and debt) were used as the sole measure of reasonable profit, the company could pile up a much higher rate of profit for its stockholders by the mere expedient of borrowing money to increase the total investment, rates officials point out.

As an example, a company starts out with $1-million equity and no debt. A 10% return granted by CAB on that amount yields $100,000 profit. Now the company borrows another $1 million, making total capital involved $2 million.

Next year CAB grants the same 10% return on investment, but the investment actually has doubled to $2 million. CAB grants $200,000 profit. The airline pays its 4% interest on the debt, or $40,000, to the bank. That leaves $160,000 profit for the equity—or 16% return on the investment of the stockholder.

Thus the CAB staff says it must look at the return of the common stockholder as well as the return on total investment.

▶ **Study Issues**—One of the most important issues in the CAB passenger fare study is whether to use the return on common equity as a measure of reasonable profit.

• **Sales margin or markup.** Some airlines recently urged the Board to use the "operating ratio" concept of rate-making on passenger fares. Sales profit margin is gross revenues less expenses. CAB sometimes uses this system, as do other types of companies as a short-term yardstick of sales price markup over cost.

However, in regulatory rate-making, CAB officials generally insist that in deciding what is a "fair" profit, the final, long-term measure is what is fair to the investor. Company owners (and CAB) try to arrive at the price (fare level) that will realize the best return on investment in the long run, Board staffers explain.

The investigation will explore the relationship of sales operating ratios and return on investment.

• **Long-term profit level.** The last major problem in evaluating reasonable rates is the decision as to how long a period to consider at one time. CAB argued in its majority opinion dismissing the passenger fare hearings that although recent profits were "excessive," the 14-year average return on investment was 8%, exactly the Board's historic index of reasonable return. Chairman Oswald Ryan is particularly anxious over airlines' ability to weather economic reverses in the future. He told AVIATION WEEK that the Board is putting the airlines on notice that they can't look to CAB to bail them out if they hit short-term losses in the future. The Board, he says, will then look back to this period of excessive profits as an equalizer of future substandard profits.

▶ **Hearings Next Year**—The scope and background of the fare analysis guarantee that the Board will propose a number of changes in the airline passenger fare structure. The airlines are likely to agree to some technical adjustments immediately, but to protest any general change that threatens to lower their profit margins. The Board will hold hearings on those adjustments opposed by the airlines.

Domestic Trunkline Earnings 1939-52

	Net return on total investment	Common stockholders' ret. on equity
1939*	2%	2%
1940*	13	14
1941*	5	4
July-Dec.		
1941	14	16
1942	20	22
1943	17	18
1944	18	18
1945	9	11
1946	..	..
1947	..	..
1948	..	..
1949	6	9
1950	12	22
1951	15	25
1952	14	23

*—Fiscal years ending June 30.

Note: Explanation and source same as box 1.

North American Fights for Rate Cut

North American Airlines, dominant nonsked operating within the U.S., last week made several major moves to expand its 3-cent-a-mile "air bus" program and persuade Civil Aeronautics Board and/or Congress to let the company keep expanding the coach service it pioneered.

The company:

• **Bought its eighth four-engine transport,** a Douglas DC-4, from Delta. North American already flies five 80-passenger DC-4s and has two Douglas DC-6Bs on order.

• **Planned rear-facing seats** for its entire fleet, including the DC-6Bs, following good customer acceptance of one converted DC-4 (AVIATION WEEK June 8, p. 84).

• **Elected former Senator Joseph C. O'Mahoney,** veteran anti-monopoly crusader, as a director of North American Aircoach Systems. O'Mahoney says the government can no more grant an exclusive franchise on the entire airspace above the continent than to the minerals beneath it. He is past chairman of the joint House-Senate Economic Committee and of the Senate Armed Services Appropriations Subcommittee.

• **Revealed a cut-rate,** 21-city route plan for its DC-6B, if CAB will allow it. North American now gets 3.3 to 3.5 cents a mile—says it could have made a narrow profit margin at 3 cents last year on the DC-4 operation alone. Certificated competitors generally charge about 4 cents a mile on aircoach.

• **Released a 250-page economic study** of the air transport business potential prepared by Robert R. Nathan Associates, economic consultants, as a North American exhibit in the large irregular carrier investigation. The study may be incorporated in the Senate Small Business Committee record on Civil Aeronautics Board and the nonsked airlines.

▶ **O'Mahoney Talks**—Sen. O'Mahoney, speaking at a press luncheon in Washington, based his presentation on the Nathan economic study, which shows that the certificated airlines probably will triple their 1952 business volume by 1975, and still leave enough room for nonskeds to fly as many passenger-miles as the certificated carriers now carry.

He said the Civil Aeronautics Act was never intended to grant exclusive rights on the nation's airspace to 13 "grandfather" companies which happened to get into the act when the act was written. "Irregulars, as in the case of the North American group, . . . should not now be liquidated because of technical interpretation of the law or a misunderstanding of the extraordinary

First-Class vs. "Air Bus"

	Certificated First-Class	North Amer. Air Bus
New York-Washington	$14.40	$7.20
San Francisco-Denver	65.10	32.55
New York-Pittsburgh	21.60	10.80
Los Angeles-Okla. City	78.00	39.00

Source: North American Airlines.

prospects for the expansion of air traffic," Sen. O'Mahoney said.

O'Mahoney added that "aircoach traffic which was initiated by 'irregular' carriers in 1946, 1947, and 1948 was so successful that in 1949 the reluctant 'grandfathers' adopted the plan, and although they did twice as much of this business as the 'irregulars' during 1952, . . the 'grandfathers' would like to see the youngsters driven from the air."

▶ **Open Hearings**—CAB holds enforcement hearings next week aimed at cutting North American's coach service back to a fraction of today's volume, or revoking its operating authority entirely if company refuses to curtail flight frequency.

O'Mahoney said that there were 16 trunk airlines when the Civil Aeronautics Act was passed, that "they have been reduced to 13 and pending mergers may effect another reduction to only 10 or 11." He concluded that "it was never the concept of Congress that the unbounded air above the United States would ever be reserved for the use by a few."

Airlines Talk Wages

Wage talks of Eastern, Capital, National, Northwest, TWA and United airlines with the International Association of Machinists continued last week after a one-day wildcat strike against Capital was cut short by IAM.

Main union demands: general wage increase; shortening of the wage progress from bottom to top scale; higher shift differential; triple time for holidays; retroactive pay increases.

Ansett to Buy TOA

(McGraw-Hill World News)

Melbourne—Ansett Airways Pty., Ltd., third largest Australian domestic airline, plans to purchase the assets of Trans-Oceanic Airways if the government's Department of Aviation approves, as expected.

Germans Plan All-Piston Airline

But start of new Lufthansa operations is postponed by delay of government agreements with Allies.

By Gerald W. Schroder
(McGraw-Hill World News)

Frankfurt—Continuing delays in final ratification of the Allied-German contractual agreements are postponing the start of new German Lufthansa operations on European and overseas air routes.

Preparatory work for Lufthansa operations is being carried out in the offices of A. G. fuer Luftverkehrsbedarf (Aviation Equipment Corp.) in Cologne. Only after the contractual agreements have been ratified will the "legal basis" have been created on which the Lufthansa can operate. At that time, final announcement can be expected on the quantity and type of planes to be purchased for Lufthansa.

▶ **Piston-Powered Fleet**—In the meantime, conversations with officials of Aviation Equipment point to the following developments and trends in the rebirth of German civil aviation:

• **Plans for the purchase** of jet or turboprop aircraft have been ditched for the time being. The Germans feel that not enough "concrete results" are available on jet operations to warrant investment of sizeable sums. It is clear, however, that the Germans are paying closest attention to jet developments and won't hesitate to switch over to jet transports when the time seems proper.

• **As a starter,** they plan to buy the "absolute minimum" of reliable, well-proven, propeller-driven aircraft. Only new equipment will be purchased. It is highly probable that the total number of planes purchased at the start of operations will not exceed 20. These will be divided fairly evenly among types suitable for inter-European and long-distance routes.

Although airline officials won't commit themselves in any way, they say "the Convair 340, the DC-6B, and the Super Constellation are now receiving our closest attention." On the basis of this statement it can be assumed that anywhere from five to 10 Convair 340s will be purchased for shorter routes and 10 to 15 DC-6Bs or Super Constellations will start operating on trans-Atlantic, African and Far Eastern routes.

▶ **Training Time**—German officials are pleased that delivery terms are "getting better."

They still expect they will have to wait up to a full year for delivery of new aircraft.

It is certain, however, that they will put this time to good use. They say it will take them about eight months after they receive the go-ahead signal to get ready for full-scale operations. During this time, they will train flight and ground personnel, set up maintenance

FT. WORTH TERMINAL HAS BIG VISITOR

Giant Convair XC-99 cargo transport is seen on the apron of the new Greater Ft. Worth International Airport, Tex., which was opened for service on Apr. 26. This photo shows the six-engine USAF transport has been fitted with a protruding nose radome. The Pioneer Air Lines' Martin 2-0-2 near the Convair's port wing provides a scale by which the size of the big plane can be measured.

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and repair crews and establish overall operating procedures.

New Lufthansa headquarters probably will remain in Cologne, although officials say they would "certainly like to return to Berlin if Germany is ever unified again." Home port for the Lufthansa fleet will be established either in Hamburg or Munich, with Hamburg now enjoying a slight edge. If Hamburg is chosen, this German city would enjoy the dual role of being headquarters for German merchant shipping and civil aviation.

No German pilots are being trained now for Lufthansa. Again, the absence of a legal basis makes this impossible. As soon as ratification is accomplished, however, regular training courses will be established in schools in either Hamburg or Munich. It is probable, German officials say, that American instructors will be utilized in this program.

▶ **Pooled Aircraft Industry**—Another factor contributing to this "American-oriented" trend is the complete absence of a German aircraft industry at this time. Although officials of Aviation Equipment Corp. say they would like to be able to buy from native sources, they admit it will be "several years" before German-designed and -produced aircraft will be available to them.

However, sources in Duesseldorf report a group of former aircraft manufacturers led by Willy Messerschmitt, Ernst Heinkel and Claude Dornier are planning to pool their resources and form a new German aviation industry.

The group planned to come to the U. S. late this month at the invitation of United Aircraft Corp., sources say, but postponed the trip until early this fall.

▶ **Route Plans**—Final determination of routes to be flown depends on delivery dates of aircraft. If long-distance planes are the first to become available, the Germans plan to start operations of Lufthansa on runs to the U. S., South America and South Africa. If operations begin with smaller types, they probably will open up initial routes to Rome, Paris, Stockholm and London.

The Germans don't feel that Lufthansa operations seriously will affect operations of foreign carriers "for some time to come." Only when the new Lufthansa can satisfy internal demand do German officials expect some foreign carriers to curtail service here. Scandinavian Airline System officials said, some time ago, they would curtail intra-Germany service as soon as a German airline started operating.

▶ **Federal Financing**—Aviation Equipment is now capitalized with approximately $1,428,000 in shares. Within three to four years after the start of Lufthansa, the new German carrier will have to raise between $33,334,000 and $35,715,000. This amount will be raised from the federal and state governments, and from private sources; the federal government will hold the majority of shares. The Germans have no great objection to foreign capital participating in Lufthansa but say none has been offered so far and that this possibility has not yet been fully explored.

It is interesting to note that the amount needed for the new Lufthansa coincides closely with the total named as the annual income of foreign air carriers in Germany, $34,524,500. Of this amount, officials say, only $11,905,000 is spent in Germany by the carriers, while an estimated $23,810,000 is "lost" to the country. This has been one of the most potent arguments of the organizers of Lufthansa; they feel that a German carrier would be one of the most effective foreign exchange earners for the Federal Republic.

Aviation Equipment officials estimate the new Lufthansa will reach "operational maturity" within four years after the start of operations and will be financially self-supporting by that date.

Of the total amount needed for Lufthansa, present plans call for $30,953,000 to "be raised in U. S. dollars," a further indication that American aircraft and equipment will form the material core of the new airline.

▶ **Duty-Free Imports**—Present financial estimates are based on the assumption that the German parliament shortly will pass a bill allowing Lufthansa to import planes and engines free of duties. Passage of this bill is expected within a few weeks.

It should be noted, however, that imports of spare parts are not covered by this bill. This will mean, in effect, that Lufthansa either will pay import duties on spare parts or have Lufthansa planes repaired outside of Germany whenever that is feasible.

▶ **Watchful Waiting**—The Germans are watching closely developments in tourist-class service. Lufthansa operations probably won't include aircoach in the initial phase of operations, but it can be expected that tourist service later will become part of their long-distance routes. The same applies to the future inclusion of airfreight and helicopter service in Lufthansa schedules.

Although the Germans are extremely anxious to become airborne again, they appreciate the fact that time, in one respect, works in their favor: as each passing month brings new developments in the fast-moving picture of civil aviation they still can enjoy a period of "watchful waiting," benefit from the latest advances abroad and withhold their final decisions until "all the results are in."

Fred Lee Starts Safety Reshuffle

Civil Aeronautics Administrator Fred B. Lee last week started his long-expected reshuffle of CAA's Office of Aviation Safety by naming a new chief and deputy chief of the Aircraft Engineering Division.

William H. Weeks, head of the Aircraft Engineering Branch in the Kansas City CAA region since 1942, was transferred to Washington to succeed George Haldeman as head of the division. Waldemar A. Klikoff, who has been head of the CAA Aviation Safety Division in Los Angeles and is recognized as one of the best qualified transport engineers in CAA, was named deputy chief.

Haldeman, who has been on leave on a special assignment as head of the CAA turbine-powered transport study team since last November, continues in the study assignment. Harold B. Hoekstra, former CAA chief engineer, also continues his assignment with the turbine transport team.

Omer B. Welling, Deputy to Haldeman and since November acting chief, is moved to fill Weeks' regional post at Kansas City. Changes will be effective early in July.

▶ **Industry View**—Observers saw the change as a considerable improvement in the Washington Office of Aviation Safety setup. Both new appointees are Massachusetts Institute of Technology engineering graduates, with the added qualification of aircraft industry experience.

Most of Weeks' experience in the field and in CAA has been with small aircraft. He formerly operated a flight base at Kansas City Municipal Airport and was an engineer for Luscombe and Rearwin aircraft companies. In his CAA work at Kansas City, he also dealt primarily with certification of light aircraft and the twin-engine Beech Model 18 transport.

Klikoff participated in development of the Douglas DC-3 and DC-4 as assistant chief of the Analysis Section and previously had worked on the Lockheed Vega and on metal-clad airships at the Aircraft Development Corp., Detroit. Before getting the top aviation safety assignment in Los Angeles, he was head of the Aircraft Engineering Branch there, and has had broad experience with transport certification problems.

CAB ORDERS

Southwest Airways final mail rate fixed at estimated $1,042,919 a year from last Sept. 1 forward with no extra subsidy for Martin 2-0-2 operation (AVIATION WEEK June 1, p. 81). Adopted June 2. Order No. E7431.

Shulman, Inc., airfreight forwarder, granted right of letter of registration upon filing of a tariff. June 1. E7430.

Lake Central Airlines temporary mail rate fixed to yield estimated break-even need of $1,331,450 a year from Apr. 1 forward. June 1. E7429.

International Air Transport Assn. proposed amendment disapproved. IATA asked right of its traffic conferences to have power to set mail rates airlines would charge foreign postal administrations, the P. O. and Justice Departments objected. CAB ruled it would impair Postmaster General's effective regulation of mail rates to foreign carriers. May 29. E7428.

New York Airways granted exemption to serve Farmingdale, N. Y., using Liberty Aircraft Park heliport. May 29. E7427.

Pan American World Airways, Canadian Pacific Airlines and other inter-company agreements approved. May 29. E7426.

Inter-airline financial terms on interchange agreements approved. May 29. E7425.

Airman pilot certificate of Robert Hutchins suspended 30 days for flying an unairworthy plane and making repairs without mechanic certificate. May 20. S570.

Airman pilot certificate of George Loewen suspended 60 days for minor accident while flying without current medical certificate or identification card. May 29. S571.

American Airlines denied exemption from restrictions on coach service to San Francisco and Oakland competitive with TWA and United from Chicago. American filed

ALITALIA'S FIRST CONVAIR 340

Resplendent in its Aerolinee Italiane Internazionali markings, here is the first Convair 340 to be delivered to the carrier. Alitalia has ordered three of the 44-passenger planes. First 340 will be used for crew training before going into service this summer.

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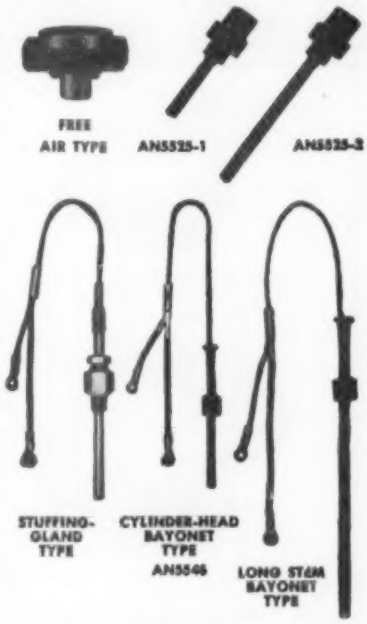

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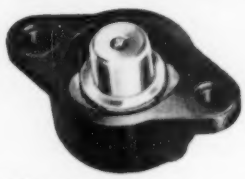
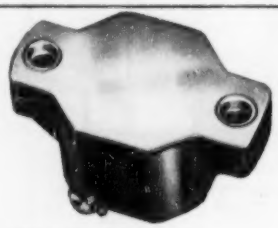


PDLM Manual Reset
Ratings: 35 to 150 Amps.
Weight: 5 oz.



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PDM Manual Reset
Ratings: 15 to 40 Amps.
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after UAL cut back its DC-4 aircoach seating last November. May 29. E7424.

Nonscheduled airlines Air America, Great Lakes and North American denied exemptions to offer transcontinental coach services competitive with United, having filed at approximately the same time and for same reason as American. May 29. E7423.

Continental and Western Air Lines dismissed from tariff liability rules investigation after agreeing to CAB request that customers have normal rights of suit in case of damage or injury. May 28. E7422.

European-American Airlines and Overseas National Airways denied applications for trans-Atlantic cargo rights equal to those granted Seaboard & Western and Transocean. CAB cites "lapse of time and change of circumstances since the grant of exemptions to Seaboard and Transocean." All applied for exemption at about the same time last summer. May 28. E7421.

Riddle Airlines granted exemption to fly perishables from West Palm Beach, Ft. Pierce, Palatka and Jacksonville, Fla., to New York. May 28. E7420.

Pan American denied change in service plan that would have permitted service to Rome en route from Frankfurt to Istanbul competitive with TWA. May 18. E7419.

Trans World Airlines denied change in service plan that would have permitted service Frankfurt-Zurich competitive with PAA. May 18. E7418.

West Coast Airlines denied change in service pattern to Idaho Falls, Richland, Wash., and Boise, Ida., competitive with United. June 27. E7417.

CAB CALENDAR

Prehearing conferences:

National Airlines Miami-Philadelphia coach fare investigation. Docket No. 6082. Examiner F. Merritt Ruhlen. June 19.

United Air Lines Hawaiian mail rate. 2913. Herbert Bryan. June 23.

Examiner hearings:

Large irregular carrier investigation. 5132. Richard Walsh and Ralph Wiser. In progress, Miami Beach.

Trans-Atlantic cargo case. 3041. Herbert Bryan. In progress.

Trans-Pacific certificate renewal. 5031. Thomas Wrenn. June 22.

North American Airlines enforcement proceeding. 6000. William Cusick. June 23.

United suspension at Rock Springs, Wyo. 5995. Ferdinand Moran. June 25.

Flying Tiger-Slick Airways merger. 6047. F. Merritt Ruhlen. June 29.

Personal injury rules. 6149. James Keith. July 6.

Safety regulation change on fuel range requirements. July 30.

Ozark Air Lines certificate renewal. 5988. James Keith. Aug. 17.

New York-Chicago route extensions case. 986. William Cusick. Sept. 21.

Oral arguments before Board:

Continental-United interchange. 5828. Barron Fredricks. June 16.

Shorthaul fare investigation. 6098. Paul Pfeiffer. Indefinitely postponed.

(Shortlines appears on page 92)

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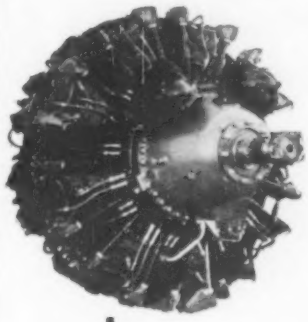

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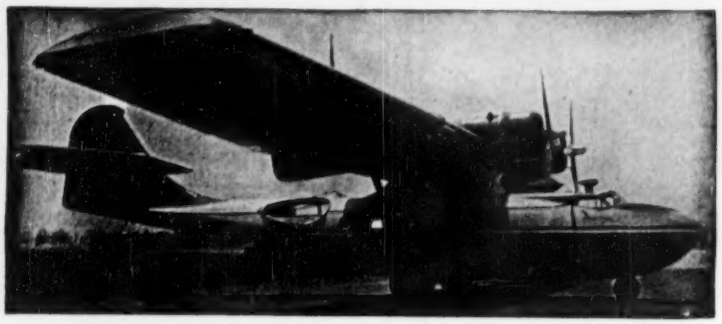

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9	20000-8A-14	Eclipse	Magnesyn Pos. Ind
23	20100-11C-4-A1	Eclipse	Wing Flap Indicator
11	DW-33	Eclipse	Transformer
23	CO-2	Eclipse	Switch Box
75	1195-4-A	Eclipse	Vibrator
80	DW-28	Eclipse	Transformer
11	2227-11-D3A	Eclipse	Tachometer
75	1416-12E	Eclipse	Starter
100	716-3A	Eclipse	Generator (NEA-3A)
384	564-2A	Eclipse	Oil Separator
71	828TY13Z2	Weston	Oil Temp. Indicator
40	119862	Weston	Carb. Air Temp. Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
1000	AN5780-2	G.E.	Wheel & Flap Position Indicator
40	828TY12Z2	Weston	Dual Carb. Temp. Gauge
11	727TY70Z2	Weston	Air Temp. Ind.
85	727TY72Z2	Weston	Air Temp. Gauge
88	727TY73Z2	Weston	Air Temp. Gauge
83	727TY74Z2	Weston	Air Temp. Gauge
10	728-40Z2	Weston	Air Temp. Gauge
21	8DJ20AAY	G.E.	Cowl Flap Ind.
22	77C5	Lewis	Carb. Air Temp.
16	76B19	Lewis	Cyl. Head Temp.
23	77C3	Lewis	Oil Temp. Gauge
13	77C4	Lewis	Oil Temp. Ind.
30	47R91	Lewis	Free Air Temp.
33	47R92	Lewis	Air Temp. Gauge
28	47B93	Lewis	Air Temp. Gauge
54	47B94	Lewis	Air Temp. Gauge
22	906-6-041	Kollsman	Diff Press. Gauge
48	254BK-6-052	Kollsman	Diff Press. Gauge
33	DW-47	Eclipse	Transformer
46	117-47	Edison	Fire Detector
19	117-10	Edison	Control Box
200	981280	Kidde	CO2 Cylinders
43	966090	Kidde	Interconnector
104	966670	Kidde	Pressure Control
225	981591	Kidde	Tee
151	A-4614	Kidde	Switch
47	M870036B	Kidde	CO2 Cyl.
74	993748	Kidde	Oxygen Cyl.
326	982585	Kidde	Valve
325	AN60009-1B	Oh. Chem.	Valve
247	AN6009-2A	Oh. Chem.	Valve
47	2-1046-76	Parker	Valve (3000 PSI)
115	P4CA9A	Parker	Primer
68	SP4-9746-77	Parker	Restrictor Valve
105	SP4-9746-78	Parker	Restrictor Valve
68	6-746-10	Parker	Valve
40	SP4-9746-79	Parker	Restrictor Valve
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127	PL2-9546-75	Parker	Cone Check Valve
123	PI2-9546-76	Parker	Cone Check Valve
620	PL2-9546-77	Parker	Cone Check Valve
540	PL2-9546-78	Parker	Cone Check Valve
142	SP4-9746-76	Parker	Restrictor Valve
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775	AN3096-5	Grimes	Dome Light
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SHORTLINES

▶ **Air Coach Transport Assn.** board of directors has elected Gus Callas, president of General Airways, to succeed Amos Heacock as an ACTA director. ACTA had not elected a new president since resignation of Heacock last February.

▶ **Air Transport Assn.** annual awards to airline employes for weather research go to H. G. Corwin, TWA, $250; J. D. MacDonald, United, $150; and C. P. Barker, American, $100.

▶ **America's airlines** spent $10 million for newspaper advertising in 1952, according to American Newspaper Publishers Assn., more than any other transportation media.

▶ **American Airlines** is shooting for certification of the DC-7 by early November, operation late the same month.

▶ **Civil Aeronautics Administration** has eliminated regional medical offices. Physicians giving flight physicals henceforth should mail forms direct to Medical Division, Office of Aviation Safety, CAA, Washington 25, D. C.

▶ **Civil Aeronautics Board** has not yet drawn a legislative program for recommendation to the 83rd Congress. . . . CAB still is looking for more efficiency to meet its new budget, slated to be no greater than last year's despite increased work load and some higher salaries.

▶ **Cubana** has been granted an additional six months to start direct service Havana-New York.

▶ **Delta-C&S Air Lines** domestic mail rate of 53 cents a ton-mile proposed by CAB is opposed by Postmaster General, who would have the Board set a single overall domestic-international rate, as ruled recently in the C&S Federal Circuit Court decision (AVIATION WEEK May 18, p. 83).

▶ **KLM Royal Dutch Airlines** is extending its Caribbean routes farther north from El Salvador through Guatemala to Mexico City, competitive with Pan American World Airways and the El Salvador flag line, TACA, a PanAm affiliate. KLM service now extends from Panama to El Salvador with flights from Central America to Europe.

▶ **National Airlines** has offered CAB a compromise settlement on its back mail pay case. National claimed CAB owed the airline $1.5 million; the Board claimed NAL was overpaid $1 million. The carrier now offers to call all square, no payments either way.

▶ **Northwest Orient Airline** will move its headquarters from St. Paul to New York, NWA president H. R. Harris announces. The change is expected to be made sometime this summer. An airline spokesman says Harris ordered the move to separate top policy planning from daily administrative tasks, establish closer identification with Northwest's major market. Another change, contemplated by the carrier: transfer of NWA's maintenance base at Holoman Field, St. Paul, to Seattle or Minneapolis-St. Paul Airport.

▶ **Pan American World Airways** reports its Pacific traffic increased 49% from a year ago during the first five months of 1953. The mainland-Honolulu segment is up 81% due to aircoach inauguration. Total Pacific passengers Jan.-May this year: 36,069.

▶ **Pioneer Air Lines** is offering its nine Martin 2-0-2s for sale at $485,000 each under a contract similar to that in which Capital Airlines sold its three Super DC-3s to U. S. Steel and continued to operate the planes for the corporation. Pioneer says it spent more than $50,000 improving each plane, another $25,000 on new radio equipment for the transports.

▶ **Philippine Air Lines'** inaugural flight San Francisco-Mexico City is slated for June 18, following CAB approval last week of PAL's right to fly the route under the Philippine-U. S. air agreement.

▶ **Riddle Airlines** has added another New York-Miami-San Juan cargo flight providing overnight delivery of freight.

▶ **State Department** has signed a new bilateral air agreement with Cuba.

▶ **Trans World Airlines** last week inaugurated a new passenger service: truck-borne ticket offices with public address systems. One is based in Los Angeles, the other in San Francisco. TWA coach fares from Boston will be: Chicago $40, Los Angeles $106, San Francisco $110.

▶ **United Air Lines** is testing Maxim mufflers on its Convair engines. . . . Company is installing underground fuel and electric power facilities at major loading terminals along its routes, eliminating clutter, operating cost and damage risk of conventional gas trucks and mobile ground power units. . . . United will run operations of its entire system from its new $1-million, 90,000-sq.ft. office building at Stapleton Field, Denver, rented from the city at $90,000 a year.

AVIATION CALENDAR

June 16—Seventh session of the assembly of the International Civil Aviation Organization, Brighton, England. Session is expected to last three to four weeks.

June 16-19—Spring technical meeting of the American Welding Society, Shamrock Hotel, Houston.

June 17-19—Mid-year meeting of Aviation Distributors and Manufacturers Assn., Chateau Lake Louise, Alberta, Canada.

June 19-21—Pennsylvania State Wing convention of the Air Force Assn., Hotel Roosevelt, Pittsburgh.

June 22-July 3—Special summer program presenting a formalized theory for analysis and synthesis of feedback control systems and classes July 6-17 in advanced strength of materials, Massachusetts Institute of Technology, Cambridge.

June 29-July 2—Semi-annual meeting, American Society of Mechanical Engineers, Hotel Statler, Los Angeles.

July 1-3—Annual meeting of University Aviation Assn., National College of Education, Evanston, Ill.

July 3-7—Seventh All-Women Transcontinental Air Race from Lawrence, Mass., to Long Beach, Calif.

July 4-5—Dedication of Coles County Airport, Mattoon, Ill.

July 9-12—Sixth International Aviation Exposition, Detroit-Wayne Major Airport.

July 15-16—IAS Annual Summer Meeting, Honors Dinner, IAS Building, Los Angeles, Calif.

Aug. 2—Amarillo, Tex., Jaycee Air Fair, observance of 50th anniversary of powered flight, Tradewind Airport.

Aug. 3-8—Fourth annual congress, International Astronomical Federation, Zurich.

Aug. 19-21—Western Electronic Show and Convention, San Francisco.

Aug. 19-24—Seventh International Model Plane Contest, sponsored by Plymouth Motor Corp., Selfridge AFB and Belle Isle, Detroit.

Aug. 25—Opening of the ninth legal committee meeting, International Civil Aviation Organization, Rio de Janeiro.

Sept. 5-7—National Aircraft Show and 50th anniversary of powered flight, Dayton (Ohio) Municipal Airport.

Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, Hampshire.

Sept. 7-17—Fourth International Aeronautical Conference, joint meeting of RAeS and IAS, London.

Sept. 21-25—Eighth National Instrument Exhibit, Instrument Society of America, Sherman Hotel, Chicago.

Sept. 23-24—1953 meeting of Aircraft Spark Plug and Ignition Conference, Champion Spark Plug Co., Toledo.

Sept. 28-30—Ninth annual meeting, National Electronics Conference, Hotel Sherman, Chicago.

Sept. 30-Oct. 1—Aircraft electric equipment conference, American Institute of Electrical Engineers, Seattle.

Oct. 8-9—New England section meeting, Society of the Plastics Industry, Inc., Equinox House, Manchester, Vt.

Oct. 28-30—Annual convention of Southeastern Airport Managers' Assn., Marlin Beach Hotel, Ft. Lauderdale, Fla.

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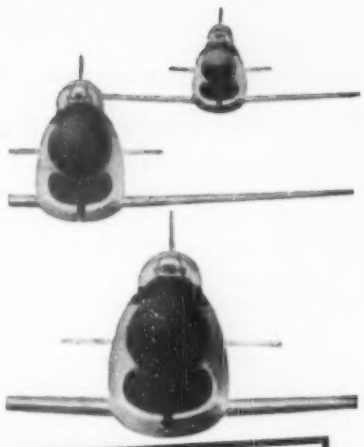

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EDITORIAL

Air Power Is Sabotaged

The dramatic battle of Gen. Hoyt Vandenberg and staunch backers of aviation in Congress to retain $5 billion that the new Administration wants to cut from the Air Force budget in fiscal 1954 has been sabotaged by testimony on the Air Force's contract to Kaiser-Frazer late in 1950 to produce cargo planes.

While Air Force Chief of Staff Vandenberg was pleading with a Senate Appropriations Subcommittee to reinstate $5.09 billion on the premise that every dollar counted, elsewhere on Capitol Hill other witnesses, including the Air Force's Deputy Chief of Staff for Materiel, were revealing and defending the cost and production output record of Kaiser-Frazer before members of another Senate subcommittee. They told how K-F production costs on the Packet transport rose since 1950 from a budgeted cost of $467,000 per plane to a current cost of $1,339,140, with a further increase to $1.5 million a possibility. Fairchild's current cost for the same plane is set at $265,067 per unit.

While General Vandenberg was basing the last and biggest fight of his professional life on the need to make every minute of every hour count in a maximum air buildup against the Soviet menace, Lt. Gen. Orval Cook, materiel officer, was telling the other Senate committee investigators that under the first schedule the Air Force had expected Kaiser-Frazer to complete 134 Packets by May 1952, but that when this date came, the K-F Willow Run plant had built one plane.

By Apr. 30, 1953, it had built 44 planes. Under current schedules—after repeated revisions—the Air Force expects K-F to complete the contract in March 1954. Fairchild, meanwhile, has turned out its first C-119G three months ahead of schedule. Gen. Cook admitted that since December 1950 Kaiser-Frazer had received more than $150 million (See p. 15, this issue).

After three days of official Air Force testimony, stoutly defending Kaiser-Frazer but resulting in adverse publicity for the Air Force at a crucial time, there was a sudden change in theme and Gen. Cook appeared with a hastily prepared statement that sought to reply to previous charges of committee members that he had avoided answering their questions. In it, he expressed official Air Force "disappointment" in the K-F record.

"It was only natural," General Cook said, "that the first planes produced from this new second facility would cost more than those planes coming from the previously established facility. The margin of that difference, however, is another matter and one we have been looking into with apprehension and regret . . . the Air Force is disappointed, therefore, in the performance of the Kaiser-Frazer operation."

By this time, however, much harm had already been dealt the cause of air power, the Air Force, and the aircraft industry itself, and a note of criticism began to enter into the newspaper stories on the subject.

The Cleveland Plain Dealer, for example, pointed out that the K-F "scandals" were embarrassing the air chiefs who were testifying for appropriations. "This is not a very good demonstration on how to save money," a Plain Dealer editorial said, concluding that if there is as much waste and extravagance elsewhere in the Air Force budget as the previous Administration seems to have sponsored in this case, maybe it's a good thing to cut out the five billion dollars.

In the light of the K-F record, despite the Truman Administration's second-source philosophy, we cannot understand how the Air Force could have condoned for so long—up to June 5, 1953,—its original decision to order these aircraft from a firm inexperienced in aviation, when the established aircraft industry had facilities and know-how to do the job that was deemed necessary.

It is equally difficult to understand how the Air Force allowed the series of excessive increases in unit cost of K-F aircraft to continue as long as it did. And apparently another increase is ahead.

It seems imperative, in the interest of national defense and economy, that a logical termination date should be set at once on the K-F cargo plane program, and a phase-out should be started at the earliest practical moment.

—Robert H. Wood

"Let's Watch This One"

Under this title, an editorial appeared on this page Dec. 25, 1950, following announcement of the Kaiser-Frazer contract.

"Kaiser-Frazer," said the editorial, "in less than 10 days won top government approval for a major contract for building Fairchild Packet cargo transports. That is no mean accomplishment. . . . No company in the aircraft industry has been able to duplicate this feat in recent history. . . .

"Mr. Kaiser's cost figures have not yet seen the light of day, but we shall await them with interest. . . .

"Mr. Kaiser's short-lived experience in partnership with Howard Hughes on the behemoth flying boat (Mr. Kaiser fled from aviation thereafter) is scant aviation production evidence in comparison with the years of experience piled up by Fairchild Engine & Airplane Corp. Fairchild already is producing about eight Packets a month and could have increased this rate to 20 a month in the near future. Mr. Kaiser's goal is 20 a month, with the first ship to be off the line late in 1951, but his lack of aircraft experience is against his meeting this target. . . .

"A major company, babes in the aircraft woods, should have no prior right over those with experience and know-how, merely because it happens to have won a large government loan. The nation's own defense is at stake. Quality and speed of output are needed. Why win back the government's money on a loan if you fritter it away again on a high-cost defense manufacturer who may or may not make his schedules in an ever-growing world crisis?

"True, there may come a time when everyone in the industry —and some who are now outside it—will be pushed to the limit of their facilities to meet our national emergency schedules. But that time hasn't arrived yet. Ask any major aircraft company.

"We wish the fabulous Kaiser all of the best, for the sake of the country. But this situation bears close watching."

The editorial aroused spirited comment in Washington. It was roundly criticized by Edgar Kaiser, company president. We refer the critics to testimony given so far in Sen. Bridges' subcommittee two and a half years later.

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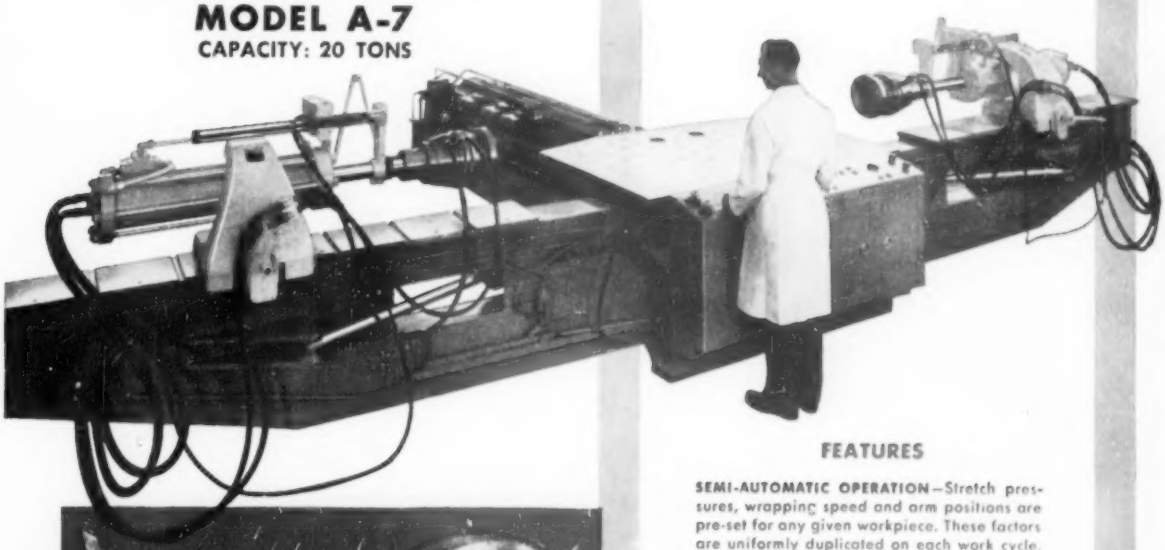

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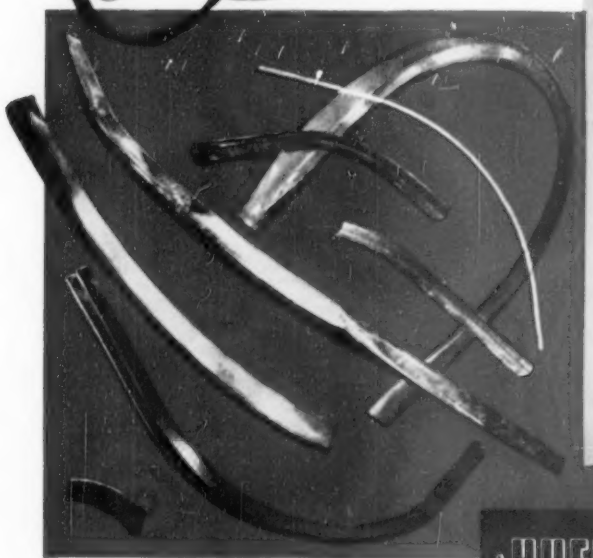

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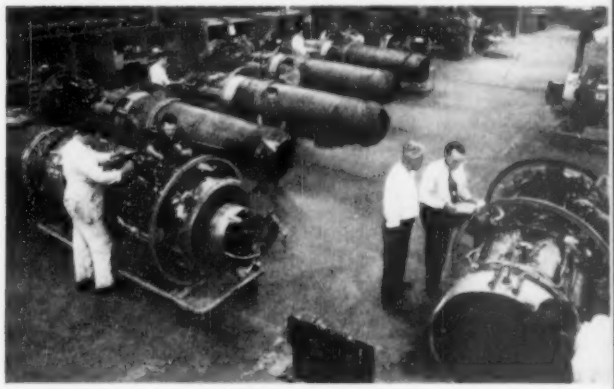

INSTALLATION OF AFTERBURNERS is typical L.A. shop job. Facility can be quickly adapted to other engine projects.

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WEST COAST AIRFRAME MANUFACTURERS, and USAF depots and bases using G-E jet engines, are served by the centrally-located L.A. shop. Additionally, trained shop representatives are sent into the field to assist and teach operating personnel new techniques and the use of new tools. Training programs are also conducted by the shop for G-E jet engine users as well as G-E personnel.

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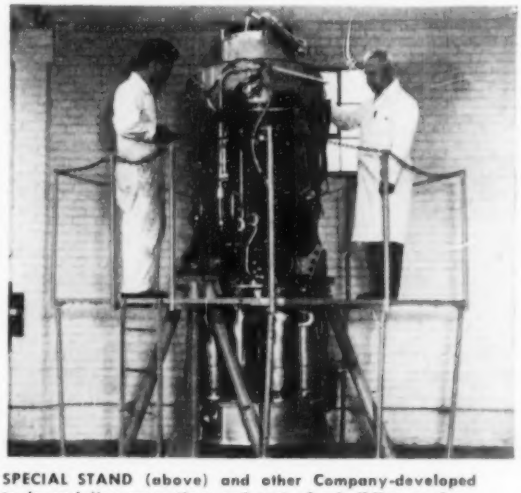

SPECIAL STAND (above) and other Company-developed tools and jigs save time and cost of rebuilding engines.